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ABSTRACT

The focus of this project is on the potential implementation of information systems in China which could provide better access to large North American bibliographic databases for the academic community. The development of a general model for implementing any educational innovation in any context is introduced. This general model is then used to evaluate a plan and develop a specific model for implementing a network to provide improved access in China to ERIC (Educational Resources Information Center). Emphasis in developing the model is on social and cultural factors, including language, economics, consideration of China's centralized hierarchical system of social control, and technological change. The proposed model emphasizes cooperation of existing information services to utilize existing resources in the most cost-effective manner and development of a network of computerized information systems to provide better access to both foreign and domestic information. The study used a naturalistic and participant-oriented approach and involved a case study, interviews, and site visits. Appendices contain background information, questionnaires, information on research methodology, detailed research findings, and information on the proposed Chinese Computerized Educational Resources Information Centers. (65 references) (JDD)

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A MODEL FOR IMPLEMENTING COOPERATIVE INFORMATION SYSTEMS IN CHINESE ACADEMIC INSTITUTIONS

by

DAVID J. S. IBSEN

Department of Education

A Thesis submitted in conformity with the requirements
for the Degree of Doctor of Philosophy in the
University of Toronto

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HE 024 263

Table of Contents

Abstract vii

Acknowledgements viii

Chapter One: Introduction 1
- 1.1 **OVERVIEW** 1
- 1.2 **INTRODUCTION TO THE PROBLEM** 2
- 1.3 **STATEMENT OF THE PROBLEM** 5
  - 1.3.1 Self-Reliance 6
  - 1.3.2 Cultural and Social Factors 8
- 1.4 **RESEARCH ASSUMPTIONS** 12
- 1.5 **PURPOSE OF THE RESEARCH** 13
- 1.6 **DEFINITION OF TERMS** 14
  - 1.6.1 The Researcher's Model 14
  - 1.6.2 The Independent Research Project 16
  - 1.6.3 A List of Acronyms 16
- 1.7 **LIMITATIONS OF THE STUDY** 17
- 1.8 **SUMMARY** 18

Chapter Two: Contextual Framework 20
- 2.1 **OVERVIEW** 20
- 2.2 **AN HISTORICAL OVERVIEW OF CHINESE EDUCATION** 21
- 2.3 **ORGANIZATION OF THE CHINESE EDUCATION SYSTEM** 24
  - 2.3.1 Work Units 26
  - 2.3.2 Academic Personnel 28
    - 2.3.2.1 *Status* 28
    - 2.3.2.2 *Ritual* 32
    - 2.3.2.3 *Interpersonal Relationships* 33
  - 2.3.3 Doing Research in China 34
  - 2.3.4 Access to Resources 36
- 2.4 **AUTOMATED INFORMATION SERVICES IN CHINA** 37
  - 2.4.1 The History of Database Services in China 37
  - 2.4.2 Organization of Services 40
  - 2.4.3 Modernization of Services 41
- 2.5 **SUMMARY** 47

Chapter Three: A Conceptual Presentation of the Model 49
- 3.1 **OVERVIEW** 49
  - 3.1.1 An Introduction to The Researcher's Model 49
- 3.2 **DEVELOPMENT OF THE MODEL** 54
- 3.3 **THE INNOVATION PROCESS** 56
  - 3.3.1 Needs Analysis 59
  - 3.3.2 Initiation 61
  - 3.3.3 Implementation 61
  - 3.3.4 Outcomes 63
- 3.4 **THE INNOVATION** 65
  - 3.4.1 Complexity 66
  - 3.4.2 Innovation Scale/Scope 66
  - 3.4.3 Demand on Resources 67
  - 3.4.4 Usefulness 67
  - 3.4.5 Contextual Fit 67

3.5 **THE CONTEXT** 68
3.5.1 Physical Conditions 70
3.5.2 Philosophical Approaches 70
3.5.2 Social Organization 72
3.5.3 Motivation and Attitude 75
3.5.4 Change 76
3.5.5 Economics 77
3.5.6 Other Contextual Factors 77
3.6 **ASSISTANCE** 78
3.6.1 Monitoring 80
3.6.2 Resource Acquisition and Utilization 81
3.6.3 Training and Skill Development 82
3.6.4 Networking 83
3.6.5 Administrative Latitude 83
3.7 **PLANNING** 84
3.7.1 Policies 88
3.7.2 Strategies 88
3.7.3 Operational Plans 89
3.8 **SUMMARY** 91

Chapter Four: **Methodology** 93
4.1 **OVERVIEW** 93
4.2 **NATURALISTIC APPROACHES TO EDUCATIONAL RESEARCH** 93
4.2.1 Case Studies 96
4.2.2 Data Collection and Analysis Techniques 96
4.2.2.1 *Participant Observation* 97
4.2.2.2 *Interview Techniques* 98
4.2.2.3 *Data Analysis Techniques* 100
4.2.3 Research Design 101
4.3 **THE INDEPENDENT RESEARCH PROJECT** 101
4.3.1 The Research Team 102
4.3.2 An Introduction to Sites Visited 103
4.3.2.1 *The Case Study Site (A)* 104
4.3.2.2 *The Alternate Site (B)* 104
4.3.2.3 *Interview Sites C, D, E* 105
4.3.2.4 *Lecture Site F* 106
4.3.2.5 *Interview Site G* 106
4.3.2.6 *Chronological Order of Site Visits* 107
4.3.3 Seminars 107
4.3.3.1 *Research Team Seminars* 108
4.3.3.2 *Cooperation With the Library and Information Science Department* 109
4.3.3.3 *Faculty and Student Seminars* 110
4.3.3.4 *Search Analyses* 111
4.3.4 Lectures 112
4.3.4.1 *Surveys* 113
4.3.4.2 *Lecture Content* 114
4.3.4.3 *Lectures at Site A* 114
4.3.4.4 *Lectures at Site B* 115
4.3.5 Interviews 116
4.3.5.1 *Interviews at Site A* 116
4.3.5.2 *Interviews at Sites C, D, and E* 117
4.3.5.3 *Interviews at Site G* 117
4.3.5.4 *Interviews With Library Groups Outside of China* 118
4.4 **SUMMARY** 119

Chapter Five: Research Findings

5.1 OVERVIEW 120
5.1.1 Data Analysis Groups 122
5.2 **ACCESS TO NORTH AMERICAN INFORMATION** 124
5.2.1 The Need for English Language Information 125
5.2.2 Access to Abstracts 126
5.2.2.1 *The Use of Computerized Information Retrieval* 128
5.2.2.2 *The Use of ERIC* 130
5.2.3 Access to Primary Documents 133
5.2.3.1 *Sources of Primary Documents* 135
5.3 **ACCESS TO RESOURCES** 136
5.3.1 Access to FEC (Foreign Exchange Currency) 136
5.3.2 Access to Equipment 137
5.3.3 Availability of Personnel 138
5.4 **COOPERATION AND NETWORKING** 138
5.4.1 Formal Cooperation 139
5.4.2 Informal Cooperation 140
5.4.3 Leadership Support 141
5.4.4 Influence 142
5.5 **MOTIVATION AND ATTITUDES** 142
5.5.1 Openness to Change 143
5.6 **SUMMARY** 144

Chapter Six: Discussion

6.1 OVERVIEW 150
6.1.1 An Introduction to CCERIC 152
6.1.2 The Development of CCERIC 153
6.2 **AN ANALYSIS OF A PREADOPTION PLAN FOR CCERIC** 154
6.2.1 Needs Analysis 154
6.2.2 Initiation 154
6.2.3 Implementation 155
6.2.4 Outcomes 155
6.2.5 The Innovation 156
6.2.6 The Context 156
6.2.7 Assistance 159
6.2.8 Planning 159
6.2.8.1 *Use of The Researcher's Model* 160
6.2.9 Summary 161
6.3 **AN INITIAL PLAN FOR A PILOT STUDY OF CCERIC** 161
6.3.1 Expected Outcomes 162
6.3.2 Needs Analysis 162
6.3.3 Access to Resources 163
6.3.4 Cooperation and Networking 163
6.3.5 Philosophical Approaches 164
6.3.6 Benefits 165
6.3.7 Policies 166
6.3.8 Strategies 167
6.3.9 Operational Plans 168
6.3.10 Summary 169
6.4 **SUMMARY** 169

Chapter Seven: Conclusions
7.1 OVERVIEW 170
7.2 THE COOPERATIVE INFORMATION SYSTEMS MODEL 170
7.2.1 Needs Analysis 172
7.2.2 Initiation 173
7.2.3 Implementation 173
7.2.4 Outcomes 174
7.2.5 Innovations 175
7.2.6 The Context and Assistance 176
7.2.6.1 *Philosophical Approaches* 177
7.2.6.2 *Cooperative Organizational Structures* 178
7.2.6.3 *Access to Resources* 180
7.2.6.4 *Motivation, Attitude, and Change* 182
7.2.7 Planning 182
7.2.8 Summary 184
7.3 **SUMMARY OF LESSONS LEARNED** 184
7.3.1 Observations on Naturalistic Approaches to Cross-Cultural Research 184
7.3.2 Observations on Conducting Social Science Research in China 185
7.3.3 Observations On Using The Researcher's Model 187
7.3.4 Conclusions on Implementing Cooperative Information Systems 189
7.3.5 Recommendations for Future Research 193
7.3.5 Conclusion 195

References 197

Appendix A: Background Information
A.1 Statements Made by IDRC 202
A.2 Problems related to Educational Information Systems and Services 202
A.3 A Brief Historical Comparison of Chinese and Western Modernization 204
A.4 The Researcher's Checklist 205

Appendix B: Questionnaires
B.1 Questions Used for Small Groups and Interviews 211
B.2 The Faculty Invitation Survey 212
B.3 Educational Information Processing Systems Seminar Questionnaire 213

Appendix C: Additional Information on The Methodology
C.1 Major Participants in The Independent Research Project 214
C.2 Administration Seminars and Meetings 214
C.3 Coordination Seminars and Meetings 216
C.3 Faculty Seminars 217
C.4 Lectures 217
C.5 Other Interviews and Visits to Groups at Site A 226
C.6 Interviews at Sites C,D, and E and The Symposium 228

Appendix D: Additional Information on Research Findings

D.1 Sample Record from the Chinese Academy of Science Database 231
D.2 The Need for English Language Information by The Science and Technology Group 231
D.3 Computerized Information Retrieval 232
D.4 Experiences With Computer Searching 232
D.5 Results of Biology Group Introduce Yourself Survey at Site A 234
D.6 Foreigners Experience With FEC and Renminbi 234

Appendix E: Additional Information on CCERIC

E.1 CCERIC Report and Computer Club Analysis 235
E.2 A Description of The Preadoption CCERIC Plan 237
E.3 Operational Plans for the CCERIC Pilot Study 238
E.4 Recommendations for CCERIC from The Independent Research Project 241
E.5 An Invitation To Participate In CCERIC 243

List of Figures

Figure 2.1 Governing Structure of Chinese Higher Education and Teacher Training Institutions. 25
Figure 2.2 Structure of A Chinese University. 27
Figure 2.3 Structure of Chinese Information Services 41
Figure 3.1 The Researcher's Model 50
Figure 3.2 Alternative paths in the problem solving cycle. 58
Figure 3.3 A view of an educational innovation project subsystem in context. 69
Figure 3.4 User-resource dialog: A checklist for resource utilization. 82
Figure 3.5 Problems resulting from inadequate planning. 85
Figure 3.6 Questions comparing strategies and operational plans. 90
Figure 5.1 Model for The Independent Research Project 121
Figure 6.1 The CCERIC Planning Model 151
Figure 7.1 The Cooperative Information Systems Model 171

List of Tables

Table 5.1 Generalizability of Research Findings 145
Table 7.1 Implementing Cooperative Information Systems 190

Abstract

The model presented in this study was developed by combining information found in the literature with information gained from a research project conducted in the People's Republic of China. The research project was prompted by the fact that very little is known about implementing new information technology such as CDROM systems within academic institutions in a developing country like China. The focus of this project is on the potential implementation of information systems which could provide better access by the academic community to large North American bibliographic databases.

First the general context of the research is presented, as background to the development of a general model for implementing any educational innovation in any context. This general model is then applied to an Independent Research Project, which was used as a source of data for this thesis. Next the model is used to evaluate a plan, resulting from the research project, for implementing a network to provide improved access to ERIC in China. Based on this evaluation the plan was revised and a general Model for Implementing Cooperative Information Systems in Chinese Academic Institutions developed. Although several factors have been considered in developing the model, the emphasis of this study is on cultural and social factors.

The study was conducted using a "Naturalistic and Participant-oriented" approach. Data collection took place over a concentrated period of five months. A case study was conducted at one site and interviews and visits were made to other sites.

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I would also like to acknowledge my parents not only for their help in developing a transcendent world view, but also for their model in serving humanity as educators. Finally, I would like to thank my wife for her support and contribution as a research assistant.

Chapter One

Introduction

1.1 OVERVIEW

The focus of this research is on accessing information indexed in large North American databases, such as the ERIC (Educational Resources Information Center) database, by educators in the People's Republic of China. Although accessing information from these databases is routine practice in North America, it is not common in China. Since China is in the beginning stages of setting up its own information systems, it is an excellent place to study the development of these systems. China's unique cultural and social heritage necessitates that information systems be implemented differently there than in North America. The emphasis of this Study is on cultural and social factors of the Chinese academic context in relationship to the implementation of modern information technology.

In this Chapter the research problem is introduced, terms are defined, and the underlying assumptions and limitations of the Study are stated. Chapter Two provides a background to academic life and information systems in China. Chapter Three presents a general model for implementing educational innovations. Chapters Four, Five and Six present the methodology, research findings, and discussions and conclusions respectively.

The Definition of Terms section of this chapter is of special significance, since it introduces two important concepts: "The

Researcher's Model", which is the central focus of this Study and "The Independent Research Project" which was the main source of data for the study.

1.2 INTRODUCTION TO THE PROBLEM

This study focuses on information systems that are used to access information indexed in large bibliographic databases produced in North America. The particular focus of the study is on the ERIC (Educational Resources Information Center) database. The ERIC database has been chosen because of its importance to the educational community in North America. It is the fourth most searched database in North America (Brandhorst, 1985, p. 59). Another reason for using ERIC is that it provides economical access to a broad range of information.

Information indexed in a large bibliographic database is typically accessed in the following manner. The user first searches the database to find information on a topic of interest. This search can either take place manually using printed indexes or by computer. The results of this search are bibliographic citations, which are often accompanied by abstracts and sometimes accompanied by full text. The user then needs to analyze the search results to find articles of interest. If an article is of interest, the user would usually then need to locate the primary document. Since the ERIC database is actually two databases combined into one, locating primary documents is done differently, depending on which part of the database the citation was retrieved from. To find primary documents indexed in the CIJE (Current Index to Journals in Education) part of the database, the user would go to the periodical section of the

library and find the appropriate journal. To find primary documents indexed in the other part of the database, RIE (Resources In Education), one would locate a microfiche copy, using the ERIC document number. Once the appropriate microfiche is selected it can be read on a microfiche reader and appropriate sections of the document can be printed on paper. The above process is straightforward and routine in North American educational institutions like O.I.S.E. (The Ontario Institute for Studies in Education).

Although China has the technology to access North American databases, it lacks a complete system to provide widespread access to these databases. In China the process would be something like this. First the user must find out that the ERIC database exists (Scientific and Technical Databases such as Chemistry Abstracts are much better known than ERIC). The user must then find access to the database. There are some printed indexes to ERIC in China, but the researcher is not aware of a complete set of these indexes anywhere in China. Online computer searching is available in approximately one hundred locations in China but it is expensive and often requires FEC (Foreign Exchange Currency). This factor excludes most potential users of ERIC from doing online searching. There is one location that has ERIC on magnetic tape but it is in the process of developing its retrieval software, so that option is not yet available. There are two locations where one can search ERIC on CDROM (Compact Disk Read Only Memory) and at least one of these charges for searching in local currency (Renminbi). CDROM searches cost less than half the cost of online searches. Therefore, to search ERIC the user needs either to pay online costs or to send his or her search requests to a center that can search ERIC on CDROM. The analysis of a search would be similar to one

in North America. To obtain primary documents for CIJE citations the user would look in the library for the document. Articles from widely distributed journals such as *Educational Technology* would likely be located in the departmental reading room and others may be at a local library. If the article is important the user may attempt inter-library loan (this system is not well developed in China). If one has Foreign Exchange Currency and/or the article is extremely important, it could be ordered from abroad. For most searches a very small percentage of primary documents indexed in CIJE would be found. Since there is no known source of ERIC microfiche in China, primary documents indexed in RIE need to be ordered from abroad. Obtaining primary documents for searches of North American databases is a major problem in China.

In order to research possibilities for developing and implementing better systems for accessing North American information, a joint research project between a Chinese university and a Canadian institution was conducted. Data from this project were used in this thesis. The research project concentrated on exploring how North American technology can be used to develop and implement uniquely Chinese systems, rather than taking the approach of implementing North American systems with little consideration for the Chinese context. As a result, it is hoped that this thesis will not only serve its academic purpose but will also be a source of information and inspiration to Chinese educators and administrators in developing and implementing information systems in Chinese academic institutions, as well as for other countries to study their context in developing and implementing their own systems.

1.3 STATEMENT OF THE PROBLEM

This study involves the transfer of technology and information from one society to another. The specific problem being investigated is the implementation of information systems which will facilitate faculty and students from China's institutes of higher education in acquiring the information they need for their academic work. In implementing these systems one needs to consider the cultural, social, and economic factors involved in the transfer of information and technology cross-culturally.

As the researcher approached the problem of transferring information and technology from one society to another, he adopted the following guiding principles. The first two principles were adapted from statements of the Information Sciences Division of the International Development Research Centre (IDRC) of Canada (see Appendix A1). The third was developed by the researcher.

1. Faculty and students from China's institutions of higher education need to have a system to access information from North America so that they can acquire information that they consider important for their academic work. They cannot rely solely on foreign sources to access the information for them.

2. In order to make access to North American information economically feasible several academic units need to participate in a cooperative network.

3. Current practices and other cultural and social factors need to be considered when implementing information technology, so as to minimize change needed to use new systems.

Principles one and two are reinforced by a series of problems identified in a report of a workshop on Educational Information, in which China was one of the participants (see Appendix A2). The report, as well as IDRC's statements, places an emphasis on technical and economic aspects of

development with little or no emphasis on social and cultural development. There seems to be an unwritten assumption that cultural and social factors are automatically considered when one considers technology transfer from one society to another. Or the unwritten assumption may be that technology is "Value-free".

Other writers on technology transfer do not make this type of assumption. For example, in reference to a specific form of cooperation, Hayhoe (1989) states: "It assumes not the transfer of specific, value-free technology, but the presentation of a whole intellectual culture, which must be understood critically if the technology it spawns is to be successfully transferred" (p. 147). Rustic (undated) states:

> Since knowledge and technology are not neutral in social terms, the high dependence of developing countries on developed nations in scientific and technological advancement has serious implications for their social and economic, and even technological, development. (p. 124)
>
> The social, economic, and cultural development of a country can not be based on imitations. It has to be conducted in line with social values and strategies, needs, and available resources. Because of their grave economic position in international relations, developing countries are emphasizing the importance of self-reliance... (p. 125)

Self-reliance as it relates to this study is discussed in the next section.

1.3.1 Self-Reliance

Nayadama, as quoted in Rustic (undated), defines self-reliance as:

> Self-reliance is not self-sufficiency or autarchy. Fundamental to self-reliance is the indigenous capacity for autonomous decision-making... Self-reliance is an open-ended concept, a strategy, a process that takes different forms in different fields, e.g. food, finance, energy, technology, etc., involving people at all levels to decide on choices and action to be taken, minimizing dependence, maximizing independence and optimizing interdependence. (p. 126)

Guiding principles number one and two are statements of what self-reliance is in relation to accessing educational information in China. Prior to the "open door policy" of 1978, there was very little opportunity for self-reliance as defined above to operate in China. Today China has a peculiar mixture of reliance, self-reliance, and self-sufficiency with respect to accessing information from North America.

The exclusive use of Chinese materials constitutes a form of self-sufficiency. Many faculty and most students at the undergraduate level rely exclusively on Chinese materials for their academic work. If information from North America is to be included in Chinese materials then it needs to be accessed by others, not those using the information. Generally, faculty rely on foreign experts or people who have been to North America to access the information they need for their academic work.

Since China has the technical ability to search North American databases one can say that China is self-reliant in its ability to access these databases. However, if one examines the availability of such databases to faculty and students in China's institutes of higher education, one would conclude that, for the most part, they are reliant on others for access to these databases. Some of the journals used by faculty and students in China are imported from North America and republished for broad distribution. In terms of their ability to access information from these journals, Chinese scholars could be considered self-reliant. Since these journals represent a small portion of the information available from North America, self-reliance in accessing information from North America is generally limited.

In summary, in some cases Chinese faculty and students are self-reliant in their ability to access information from North America, in many other cases they rely on others to access the information for them.

1.3.2 Cultural and Social Factors

The following cultural and social factors have been identified as important to accessing North American information in China: language, economics, social organization, and social and technological change.

One of the most obvious cultural factors that affects accessing information is language. Hayhoe (1989) makes the following statement about the importance of language: "Technology may well be transferred, even if one does not have a thorough knowledge of English, Japanese, German or French, but the cultural and social currents of the society that produced it will remain inaccessible" (p. 140). In dealing with information systems one needs to consider computer languages as well as natural languages. The proliferation of computer languages has been likened to the confusion of languages that occurred at the Tower of Babel. Problems related to the diversification of natural languages are resolved by learning the other person's language or by learning a common language. China's national language (Mandarin Chinese) is called "Putonghua", which means common speech. The international putonghua is English. An example of a computer language putonghua is MS-DOS (a common operating system for microcomputers). At present there is no putonghua for processing bibliographic information but one may emerge. One major difference between computer language and natural language is that machine translation

is easier for computer languages. In countries like China, which do not have a large investment in existing information systems, one possible solution for problems related to the diversification of computer systems is to adopt a common system for processing information and to translate all incoming information into that system. This would eliminate the need for users to learn several information retrieval languages to access different databases.

To access North American databases, one needs to be skilled in the use of English as well as information retrieval languages. China is placing high priority on teaching their population English. One of the goals of China's educational policy is that "as many (Chinese) as possible should learn a foreign language - especially English. Within the next five years, China hopes to become the largest English speaking nation in the world!" (Gubser, 1986, p. 16). With respect to learning information retrieval languages, Lu (1986) points out that China is making progress but more practice and exchange of experience need to take place. With increased practice and experience both in using English and information systems, problems with both human and computer languages will become a less significant factor.

Another factor that affects accessing information is economics. China, like other developing countries, has a severe shortage of foreign currency. In order to control the use of foreign currency China has issued a Foreign Exchange Currency (FEC). This currency is distributed to certain sectors of society based on national priorities. Therefore, one has a better chance of getting scientific and technical information from North America than educational information. Another economic problem

is that there is a lack of coordination and cooperation amongst work units, so that there is unnecessary duplication of expenditure. The lack of coordination between work units is also related to the third factor, social organization.

China has a centralized hierarchical system of social control that is implemented through independent work units. Zeng (1987) states that:

> Since ... scientific and technological information systems in China are constituted on the hierarchical structure of the existing administrative systems in China, it is unavoidable that they are blocked from one another and are likely to carry out the work in their own way. A modern information system has to be an open, horizontally interrelated and network-type [sic] system, so that the information services can be oriented to the society-based [sic] needs. (p. 12 - 13)

> On the one hand, the infrastructure, on which the operation and maintenance of... existing systems have been based, has to be reformed in light of the changing situations in China, [while] on the other hand, the traditional means and methods have to be updated by utilizing ... modern information technology. (p. 14)

Maier (1986a) points out that in China "A problem on campuses and elsewhere is the rigid structure of and lack of cooperation between working units. A lesson that has to be learned is that computerization cuts across these lines and breaks down walls" (p. 3). If this lesson is not learned, accessing information from North America will be limited to the privileged few who have access to information systems and most of these systems will be underutilized.

A fourth factor affecting the access to information is social and technological change. Zeng (1987) points out that database services are becoming one of the "social public utilities" like water and electricity. He also states that recent practice indicates "that the liberation of productive forces resulting from China's social reforms is stimulating the

society's demand for information" (p. 9). Social and technological change will also be brought about by professionals who have been trained in North America (Maier, 1986a).

One of the technological changes taking place internationally is the use of computers in educational institutions. In this study, the use of information technology in education is of particular significance. Li (1986, p. 6.5) states, "with the development of science and technology, automated systems are now being introduced into library and information centers, which change the way people create, collect, organize, store, find, analyze, receive, disseminate and use information in making decisions". Not only are automated systems being introduced into library and information centers but also computerized systems are being introduced into classrooms. This is changing the way in which we access information to be used in our academic activities. For example, many educators are using or experimenting with hypermedia systems such as Hypercard (a system for the Apple Macintosh computer). Other prototype systems, many of which use "Artificial Intelligence", are being tested. One of these systems is called "the information lens", which is an "intelligent information-sharing system" (Malone, Grant, Turbak, Brobst, and Cohen; 1987). Another is "an integrated system of databases [which is] a workstation for information seekers" (Micco and Smith, 1987). Although the need for these systems has been identified over the years by authors such as Bush (1945), Thompson (1979), and Gotlieb (1986), the technology to accomplish this has been a more recent development. How these systems are implemented in an educational context will depend to some extent on how social and cultural change is introduced in relationship to technological change.

Guiding principle number three states that social and cultural change should be limited when making technological change. Lam (1987) states that "Human adjustment and acceptance in automation can be difficult" (p. 9). In order to overcome this problem he designed a computer system to conform to existing practices (i.e. work sheets were not modified). He also reported that the typist's work remained intact and that automation made the task more enjoyable and efficient. Lam overcame the resistance of administration to automate by using existing hardware and inexpensive commercially available software. The net result was that cost-effectiveness was realized within one year. Not only was Lam's system cost-effective, it also minimized the social and cultural change needed to implement it.

China is implementing the latest in information technology. The widespread use of this technology will depend on social change and the implementation of the technology, so as to minimize this change.

1.4 RESEARCH ASSUMPTIONS

This research was based on the assumption that very little is known about the use of computerized information systems to provide widespread access, by the Chinese academic community, to information from North America, especially information indexed in the ERIC database. It was assumed that more information is needed before setting up large scale information systems to serve the need of China's academic community. Based on the guiding principles discussed above, the following assumptions have been made about the type of systems that are needed:

1. Faculty and students from China's institutions of higher education need to be able to acquire the information they identify as important to their teaching and research.

2. Several work units need to cooperate to provide economical access to information indexed in North American databases.

3. Current practices need to be incorporated wherever possible.

4. Social and cultural factors need to be considered in the developing and implementing information systems.

Other specific assumptions underlying this study are:

5. Social, cultural, and economic factors affect technological transfer.

6. Qualitative research methods, specifically naturalistic and participant-oriented research, are appropriate for analyzing the impact of a new technology on a society.

7. Mutual understanding develops in the context of cross-cultural discussion.

1.5 PURPOSE OF THE RESEARCH

Baark (1985) states that "...modernization of information services ... in India and China and other nations must be designed through a more comprehensive analysis of the context of information services." (For a more detailed explanation of Baark's concepts see the "Modernization of Service" section in the next chapter.)

The purpose of this research is to do a comprehensive contextual analysis, in order to develop a model for implementing cooperative information systems in Chinese academic institutions, to provide improved access to information indexed in North American databases.

The following research questions further define this purpose:

1. How do faculty and students from China's institutes of higher education access information indexed in large North American databases?

2. How do current practices and other cultural and social factors affect access to this information?

3. How can information technology be used to assist in accessing this information?

4. How does access to information indexed in the ERIC database in China, compare to access in Hong Kong, Singapore, and Canada?

1.6 DEFINITION OF TERMS

In this section terms are defined in relationship to The Researcher's Model and The Independent Research Project, which are the major concepts which need special definition. The section concludes with a List of Acronyms and a brief description of each.

1.6.1 The Researcher's Model

The Researcher's Model developed in this Study (see Chapter Three) is a general model to be used as a guide in developing context specific models and plans for implementing educational innovations. Havelock and Huberman (1977) indicate that **The Innovation Process** can be thought of simultaneously as: "a sequence of events... a set of people and institutions... a series of transformations... a problem-solving sequence... a temporary system" (see Chapter Three). The Researcher's Model attempts to incorporate these views of the innovation process by integrating factors that are part of or related to this process. Major factors identified in the model are defined below as they relate to stages in The Innovation Process or as they influence this process. Note planning is considered separately since it is also a process, which is parallel to The Innovation Process.

Factors Related to Stages in The Innovation Process

1. **Needs Analysis** refers to the process of identifying, clarifying and prioritizing needs.

2. **Initiation** refers to "those activities which precede the actual use of an innovation" (Burrows, 1980, uses this definititon for "the adoption process").

3. **Implementation** refers to the use of an innovation and all activities related to its use, prior to institutionalization.

4. **Outcomes** refer to the results of implementation. Final outcomes are measured when institutionalization occurs, i.e. the use or nonuse of the innovation has "become organizationally routine" (Huberman and Miles, 1984).

Factors Which Influence The Innovation Process

5. An **innovation** is "a deliberate, novel, specific change, which is thought to be more efficacious in accomplishing the goals of a system" (Miles, 1964, p. 14).

6. **The Context** is anything that influences or is influenced by the implementation of an innovation.

7. **Assistance** is any deliberate action or use of resources which aids the implementation of an innovation.

Planning is a process, which parallels The Innovation Process: in The Initiation Stage, plans are made for the adoption and implementation of an innovation, and in The Implementation Stage, these plans are continually revised until implementation is complete.

The Researcher's Model is described in Chapter Three and used in Chapters Four and Five as a guide for analyzing data from The Independent Research Project described below. In Chapter Six the model is used to develop a *Pilot Study Plan* for implementing an innovation called CCERIC (Chinese Computerized Education Resources Centers). In Chapter Seven it is used as a basis for **The Cooperative Information Systems Model**, which is a model for implementing information systems in Chinese academic institutions. For the purposes of this Study **Information Systems** are defined as any system that uses computers to assist in providing access to information.

A **Cooperative Information System** is any system in which two or more organizations use computer systems to facilitate access to, and dissemination of information by individuals belonging to these organizations.

1.6.2 The Independent Research Project

The Independent Research Project was a joint project conducted by the Researcher and his Chinese host. Since data from this project are used in **this Study** (which is the term used to refer to this thesis), members of **the Research Team** have been given titles that are used throughout the study. The term "**the Researcher**" refers both to the principal investigator of The Independent Research Project and the author this Study. Other members of the Research Team frequently mentioned in this Study are **the Research Assistant** (a Canadian who accompanied the Researcher) and **the Coordinator** (who was the most involved Chinese person on the Research Team). The Independent Research Project is described in more detail in Chapter Four.

1.6.3 A List of Acronyms

1. **CC-DOS** (Chinese Character Disk Operating System) An operating system similar to MS-DOS, which can be used to run DOS applications which use both Chinese and Roman character sets.
2. **CCERIC** (Chinese Computerized Educational Resources Centers) is an innovation resulting from this Study, which is designed to improve access, in China, to information indexed the ERIC database.
3. **CDROM** (Compact Disk Read Only Memory) is an optical disk device, which uses laser beams to read information, stored in digital (computer) format, from a small plastic disk. Its large storage capacity make it useful for disseminating information from large bibliographic databases.

4. **CIJE** (Current Index to Journals in Education) is part of the ERIC database which contains citations to articles in approximately 780 educational journals.

5. **ERIC** (Education Resources Information Center) is a service operated by the United States Government. There are many services related to ERIC. The most common of these are the ERIC database and The ERIC Document Reproduction service.

6. **FEC** (Foreign Exchange Currency) is used in China for most transactions involving foreign goods and services. Foreigners are given this currency in exchange for currency from other countries. Legally it is equal in value to local currency called Renminbi.

7. **IDRC** (International Development Research Centre) is a Canadian government research center with headquarters in Ottawa, Ontario.

8. **MS-DOS** (MicroSoft Disk Operating System) is a common operating system for computers that are compatible with IBM PC microcomputers.

9. **RIE** (Resources In Education) is a part of the ERIC database that contains abstracts to research reports and other information not published in journals.

10. **UNESCO** (United Nations Educational, Scientific, and Cultural Organization) is an international educational service.

11. **WORM** (Write Once Read Many) is an optical disk device similar to a CDROM, except that end users can initially write (store) their own information on the disk.

1.7 LIMITATIONS OF THE STUDY

Although the researcher has studied economics, sociology, and linguistics, his major is educational technology and minor is information science. This background limits the approach to social and cultural factors to that of an educational practitioner, with international experience and training. The case study component of the research was limited to a select number of working groups at one Normal University in the People's Republic of China. The Researcher's Model is limited by the studies upon which it is based and the knowledge and experience of those evaluating it.

Although other databases are considered, this Study is limited to the ERIC database. Several means of accessing ERIC were considered but experimentation was limited to two CDROM systems. The processing of records downloaded from these systems was done by two different word processing systems. Although a more complex system could have been developed, it was decided that this development was premature.

Although interviews were obtained from a broad audience, both in the information science and education fields; they were limited by the ability to make arrangements as well as by time constraints.

1.8 SUMMARY

Frequently, technology is transferred from one society to another with little or no consideration for cultural and social factors. In this Study the researcher has assumed that cultural and social factors are of utmost importance to the effective implementation of information systems. One of the major factors hindering effective implementation of these systems in China is the lack of coordination between work units. Another hindrance is the lack of FEC (Foreign Exchange Currency). If China is to implement new information processing technology effectively, these hindrances need to be resolved in a way that least disturbs current practices and social patterns. The results of this study, particularly the Pilot Study Plan for CCERIC (see Chapter Six), and the Cooperative Information Systems Model (see Chapter Seven) present suggestions on how this could take place.

In the next chapter a more detailed contextual framework for the study is presented. This is followed by chapters on the conceptual model, methodology and research findings. In the next chapter, which discusses these findings, an initial Pilot Study plan for improving access to information indexed in the ERIC database is developed. In the final chapter, a model for implementing cooperative information systems in Chinese academic institutions and lessons learned from The Study are presented.

Chapter Two

Contextual Framework

2.1 OVERVIEW

In this Chapter background related to this Study will be given as an expansion of the introduction presented in chapter one. This chapter is designed to give readers, who are not familiar with China, a general introduction to academic life and automated information services in China. Two views of the context are interwoven in this chapter. One is that of Chinese writers trying to explain their culture to Western audiences. The second is that of Western writers who have an understanding of Chinese culture, explaining it to other Westerners. Since the Researcher's interpretations, opinions, observations, and experiences are presented in the remaining chapters of this Study, he refrained from comment in this Chapter.

The following quotations present a general comparison of Chinese academic life to that in North America:

> The Chinese have a totally different approach towards - knowledge, learning, teaching - they need to be convinced why any changes in traditional attitudes are necessary, and to be offered proof that new/western ways may be more effective.
>
> Books and libraries are jealously guarded commodities, and access generally allowed to a chosen few. Foreign experts have to strive continually to get administrators to open up library use to all trainees.
>
> Chinese students/trainees are industrious beyond comparison; sometimes too much so, to the detriment of their less structured modes of learning - a problem of bookishness.
>
> All foreign experts belong to a specific unit (the danwei) and all formal communications, discussions, complaints, etc. must be addressed to the "responsible person" of the danwei.

> Be prepared to run into a myriad of rules and regulations, seemingly without rationality, affecting your requests for changes in scheduling, stationary supplies, books and newspapers, etc. (Random notes, undated, p. 2).

> Americans are used to a high degree of independence and self direction. The Chinese are not... The Chinese work through intermediaries. Americans like to talk things out face-to-face. This means that rather than talking over problems or concerns with the head of the department directly, you may have to work through a third person who will carry messages back and forth. Compromise, Chinese do a lot of horse-trading, bargaining, and exchange of favours... nothing is ever etched in stone (Turner-Gottschang, and Reed, 1987, p. 110).

The unique historical background of China has created a complex society with hierarchial organizations of autonomous work units, held together by centralized control and a complex network of interpersonal relationships. This Chapter will examine how this society affects academic life (especially as it relates to foreigners) and the modernization of information services.

2.2 AN HISTORICAL OVERVIEW OF CHINESE EDUCATION

Fairbanks (1986, p. 289) outlines "three distinct eras of educational policy". The first was the era of "old classical education, lasting until 1905". The second era, 1905 - 1949, was dominated by western liberal arts. The third era, 1949 - present, is dominated by communism.

The year 1905 is designated as the end of the first era, since in that year the traditional examination system was abolished. Under this system, "applicants for official life indoctrinated themselves by mastering the classics and proving their loyalty to the principles of imperial Confucianism" (p. 6-7). In this first era generalists were trained "to be like Oxford and Cambridge graduates - broad-gauge administrators, not

technical specialists" (p. 289). (For a comparative summary of this early period of Chinese history with respect to modernization, see Fairbanks' introductory chapter, part of which is summarized in Appendix A3.)

"In the second era, until the 1940s, the Western liberal arts were used to produce a modernized elite" (p. 289). This elite was made up of two groups. One was "a bicultural elite" who had studied in western institutions outside of China, thus understanding both cultures (p. 187). The second group was those who had studied in mission schools (p. 190), national universities (p. 192), and other institutions founded in China. Today, a remnant of this elite are department heads and respected teachers. During this era, the classical style of writing was abandoned for a vernacular style (p. 190).

"In the third era, after 1949, the masses, Mao hoped, could finally become a major focus of educational policy. He therefore tried to use the Soviet system to produce ideologically sound technocrats. But the actual system still faced in two directions: to give a modern education and skills to the whole people and to train up a broad-gauge elite able to take the place of the old Confucian literati-administrators" (p. 289). Historically, these administrators had a dual role of both carrying out the imperial administration and advising the ruler (p. 288). "The idea that scholars knew what to do and had an obligation to offer their advice became enshrined, for example, in the doctrine of the unity of knowledge and action, that scholarly knowledge should eventuate in action and action should influence knowledge" (p. 288). During this third era the present educational system has been influenced by the following: the Soviets, Chairman Mao and Deng Xiaoping.

The prevailing structure of today's education system is based on the Soviet influence of the 1950s (Henze, 1984, p. 128). Many of today's administrators and faculty who were educated during the period of Soviet influence "are far less familiar with Western methodologies and languages than the older generation" (Turner-Gottschang, and Reed, 1987, p. 73). In the late 1950s the Soviet influence began to be replaced with educational ideas perpetuated by Chairman Mao.

Although under Mao "Professors were prime candidates for thought reform in the 1950s, yet the fact remained that the teaching staff on the whole had not adopted communist methods and viewpoints. They were democratic socialists more than totalitarian communists" (p. 290). Since intellectuals were "of dubious loyalty, Mao moved to the idea that a new generation of intellectuals should be trained up verily committed to the party because they were of good proletarian-class background" (p. 293). As a result of policies established in this period, many of today's cadres, who often control academic life, are poorly educated.

The period of Mao's influence ended with the "Great Proletarian Cultural Revolution", which had a profound negative effect on education. Li (1986, p. 6.2) describes it as follows:

> The Cultural Revolution, which started in 1966, was a great disaster that turned China into a blank nation intellectually. Libraries, recognized as centers of knowledge dissemination, were labelled as centers of feudalism, capitalism and revisionism, with libraries called the "watch dogs" of imperialism. As a result, all kinds of library schools suffered with classes suspended, faculty members dispersed to unrelated positions and teaching materials destroyed (p. 6.2-6.3).

Lo (1984, p. 158) refers to the Cultural Revolution as a "severe blow to the image of teachers", from which they are still recovering. Another result of the cultural revolution is that there are very few qualified instructors between the ages of 25 and 40 (Lo, 1984, p. 131 and D'Auria, Kuo, and Kuo, 1984, p. 213).

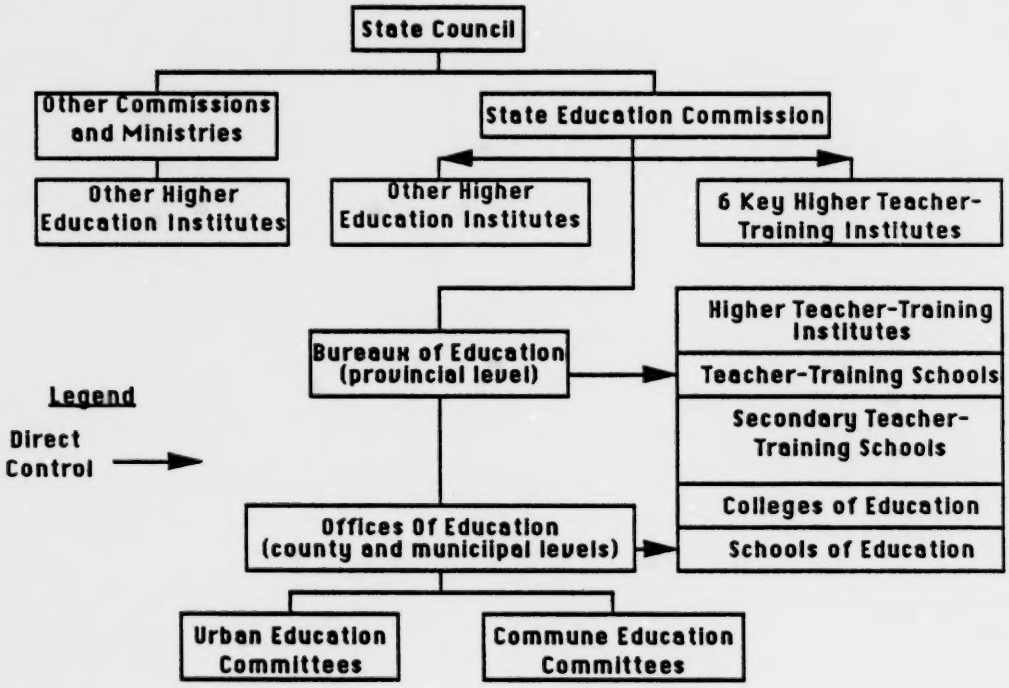
Under Deng Xiaoping's influence the modernization of education is seen as essential to the modernization of China (Li, 1986, and Gubser, 1986). Those who wish to modernize the education system using Western ideas face the problems of fitting their ideas into a system that has developed over China's long history. The problem is summed up well by the question posed by Suzanne Pepper (1982, p. 196): "Can American branches be grafted on a Soviet tree planted in a Chinese garden?" In the next section, the current situation will be discussed in more detail.

2.3 ORGANIZATION OF THE CHINESE EDUCATION SYSTEM

In this section a general overview of the organizational structure of Chinese higher education institutions is given with specific reference being made to teacher training institutions.

Figure 2.1 presents the overall governing structure of Chinese Higher Education and Teacher Training institutions. "The State Council...is the executive body of the NPC [The National People's Congress] and the highest organ of State administration. The premier directs the work of the State Council" (Structure of..., 1988, p. 15). The State Education Commission enjoys the prestigious position of being one of eight state commissions directly under the control of the State Council (p. 17).

Figure 2.1 Governing Structure of Chinese Higher Education and Teacher Training Institutions.
(Adapted from "Teacher Education in the Eighties" by L. C. Lo, in Hayhoe, R. (Ed.), *Contemporary Chinese Education*. (pp. 154-177). Beckenham Kent: Croom Helm.)



Although the State Education Commission is generally responsible for all education in China, their are many other educational institutes as illustrated by the other commissions and ministries box. Each of these has their own hierarchy.

The three levels of teacher-training institutions are described by the following quote from Jiaoyu Yanjiu (cited in Lo, 1984).

> Higher teacher-training institutes train teachers for secondary schools; teacher-training schools train teachers for lower secondary schools; secondary teacher-training schools, including schools for kindergarten teachers, enrol lower secondary school graduates and young people with the

> same level and train them to be primary school and kindergarten teachers (p. 9).

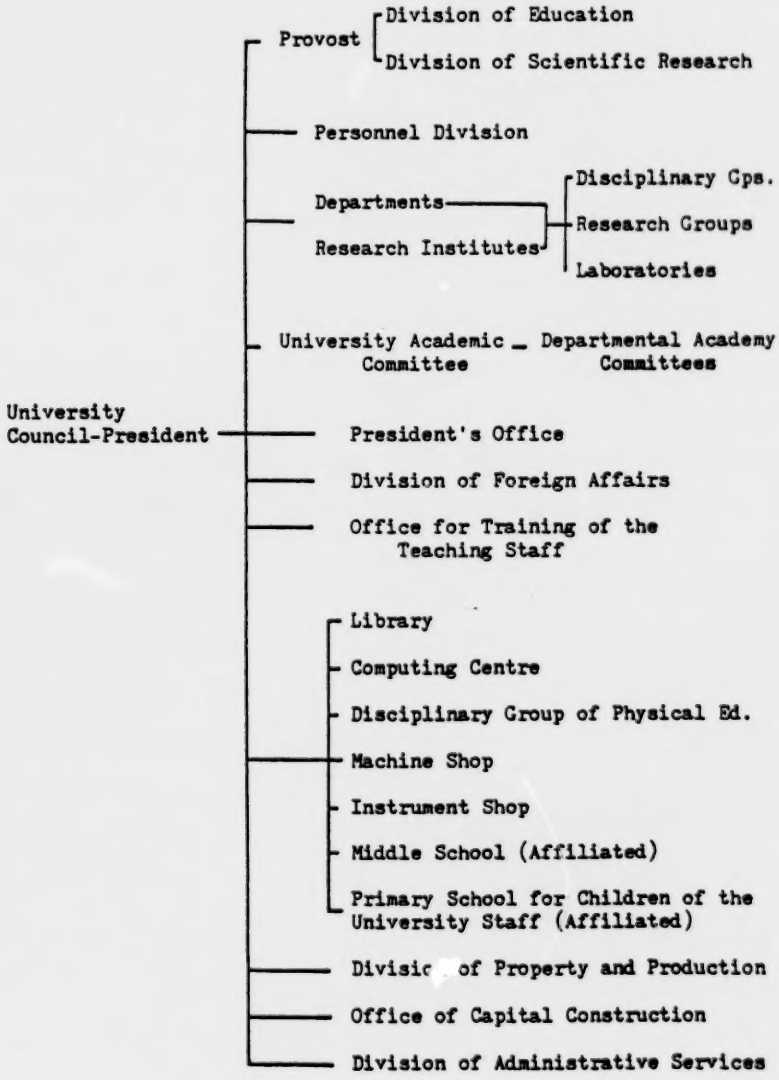
Figure 2.2 illustrates the organizational structure of a higher educational institute. Many times one person may hold several positions in the hierarchy, thus creating an interwoven structure. For example, if one examines figure 2.2 the administrative structure of research institutes and departments is separate. The primary function of each is also separate, i.e. research and teaching. The author is familiar with a situation where the chairman of a department is also the director of a research institute and 25% of the staff of the research institute are also faculty in the department. Another factor that affects the administration of Chinese institutions is the influence of party representatives. Henze (1984, p. 129) states: "Attempts to separate Party and administrative work are part of an overall reform of universities and colleges which aims to break the Party committees' monopoly over decision-making".

The whole structure is complex and quite confusing to the newcomer. Since the work unit is such an important structure, it is described in a separate section below.

2.3.1 Work Units

> The danwei [work unit] is the single most important frame of reference for all activities. Whether it be a commune, factory, research institute, or university, the work unit is a microcosm of Chinese society with its own political hierarchy, networks of personal and professional relationships, services, and, in many cases, living quarters. It is through the work unit that the Chinese government exerts its influence on the life of the individual, for it is this unit issuing the identification card that marks the bearer as a working member of Chinese society, entitled to medical care, ration coupons, and housing. And it is not only the necessities of daily life that are provided by the unit but also permission to marry, to bear the allotted number of

Figure 2.2 Structure of A Chinese University.
(From "Jiaotong University Introductory Handbook" as presented by J. Henze, in Hayhoe, R. (Ed.), *Contemporary Chinese Education. (pp. 93-153). Beckenham Kent: Croom Helm.)*



children, and to travel. The unit acts as a go-between when its members must communicate with other organizations and screens outsiders who attempt to penetrate its boundaries. Lateral relations among danwei, even those engaged in similar activities, are cumbersome for permanent members as well as

for foreign guests because of the autonomous nature of the units" (Turner-Gottschang and Reed, 1987, p. 43).

> The foreign affairs office... ["waiban" in Chinese] provides a mechanism that allows the foreigner to work within the unit without becoming integrated into its hierarchy. It is the duty of the foreign affairs cadre to interpret, negotiate, and supervise the implementation of the wishes of their foreign guests - and to take responsibility for the consequences. It is also the administrative office that handles all of the unit's external relationships, including arranging for its Chinese members to go abroad, receiving delegations, and negotiating exchange programs (p. 45).

2.3.2 Academic Personnel

Although the structure of academic institutions is complex, the web of relationships that holds academic life together is even more complex. This section will consider the status and characteristics of both foreign and Chinese academics, the place of ritual in Chinese society, and the importance of interpersonal relationships.

2.3.2.1 *Status*

As in most educational institutions students, have the lowest status. Generally students in China are "spoon-fed detailed knowledge", thus lack the ability to do independent work (D'Auria et all, p. 213; and Henze, 1984, p. 128). The following statement from a survey of the ability of Chinese science students illustrates this point:

> They are strong in acquiring knowledge but weak in creative research; Strong in their grasp of book knowledge but weak in resolving concrete problems; Strong in abstract thought but weak in comprehensive applications; Strong in mathematical reasoning but weak in means of expression. Generally speaking, the students have good intellectual qualities, they are young and have quick, lively minds. But there also is a tendency to value theory and slight practice, which influences their ability to apply theory and

> knowledge in reaching independent solutions to real problems (Hubei Provincial, 1982/1982, p. 58).

Although many Chinese students are relatively hard working, most are not motivated to go beyond what is required (Turner-Gottschang, and Reed, 1987, p. 114; and D'Auria et all, p. 213). Although those who wish to go on to graduate (referred to in China as "postgraduate") study or to study abroad are highly motivated, they sometimes may shift their energies from their classes to meet other requirements such as TOEFL (Test of English as a Foreign Language) (Turner-Gottschang, and Reed, 1987, p. 114). Maier (1986a, p. 4) makes the following comments about this group of students. "The students who were young, recent university graduates, were generally enthusiastic, receptive to ideas for computer utilization and applications within their disciplines, eager for hands-on experience, and open to creating opportunities to spread the science into new areas useful for China". Undergraduate students are required to do a thesis for their bachelor degree, which is sometimes equivalent to a major project for some master's degrees in some North American institutions. Although in some cases students may need to do some original research for these theses, most students simply follow the instructions of, and use information provided by, their supervisor. In China, "postgraduate" students are required to do an original piece of research for their master's thesis (D'Auria et all, p. 214). Although most students follow the traditional pattern – "rote memorization and passive learning" (Turner-Gottschang, and Reed, 1987, p. 74) – a small group of them is attempting to go beyond these confines to learn independently. Many Chinese teaching staff are even less likely to go beyond the confines of their job to learn new ideas.

When Chinese teaching staff take courses from Americans, they expect a more structured and rigid approach than students: i.e. structured lectures with little or no dialogue (Turner-Gottschang, and Reed, 1987, p. 113). Generally they are resistant to changing traditional patterns and may not even wish to discuss change (p. 115). However, some changes are taking place such as some choice of electives (p. 74) and faculty pursuing their own research topics (universities are still primarily teaching institutions) (p. 72).

Status amongst Chinese teaching staff is as follows, starting from the highest to the lowest; full professors (jiaoshou), associate professors (fujiaoshou), lecturers (jiangshi), teachers (jiaoyuan) and assistants (zhujiao). Some administrative personnel would have higher status and others lower status than teaching staff. Academics in China are regaining respect but have had little improvement in their economic status. Since Chinese teaching staff are underpaid, a certain amount of moonlighting is permissable (D'Auria et all, p. 213; and Turner-Gottschang, and Reed, 1987, p. 72). This, combined with academic responsibilities, makes a heavy work load, especially for more senior staff.

Status is also important to the foreigner as indicated by the following statement by Thurston (1983);

> Whether the foreigner is labelled a tourist, a foreign expert (a teacher), an undergraduate or graduate student, or a foreign scholar will have considerable bearing on what the foreigner is permitted to do. A tourist, after all, is expected to sightsee, a foreign expert to teach, a student to study, and a foreign scholar to conduct research. For a foreign expert to attempt to conduct research without official permission is to risk serious misunderstanding and potential jeopardy to Chinese friends who may have assisted in that research (p. 24).

Turner-Gottschang and Reed, (1987, p. 18) make the following statement about foreign experts: "The number of foreign expert positions is determined each year by the State Council of the People's Republic of China. Funds for the positions are also provided by the State Council (i.e, the Chinese government) in two parts; salaries and benefits". The position of "foreign expert" is well defined. Foreign experts usually are the highest paid foreign academics in China.

The "foreign teacher" is of lower status and arrangements are made on an individual basis with Chinese institutions (p. 20).

The status of "foreign researcher" is even less defined, with the exception that they are expected to pay a research fee – "$300 [U.S.] per month – if they are unaffiliated with a formal exchange program" (p. 72). They may also be required to pay research assistants and other expenses such as travel.

The status of "foreign students" determines how much they pay for tuition. Since foreign students have low status they are required to make their own arrangements. This gives them "the opportunity to understand the intricate workings of the bureaucracy because they often come face to face with it, and such experiences, although frustrating at times, also offer insights not always available to those sheltered by high status" (p. 47).

2.3.2.2 *Ritual*

Ritual plays an important part in affirming one's status. Turner-Gottschang, and Reed (1987, p. 54-55) state: "Ritual plays the same role in contemporary China that it did in the past – it reaffirms boundaries, clarifies ranks, and teaches proper behaviour by example. How and by whom you are greeted at the airport upon arrival, the order in which officials enter a room, the seating patterns at a welcoming banquet all place hosts and guests in their proper place in the hierarchy". An American teacher made the following comments about ritual: "there are a lot of banquets and other displays of friendship which cover up some very hard bargaining. One needs to go along with all the formalities and rituals and still be very assertive concerning one's own interests" (p. 110). In the interest of economy and efficiency elaborate banquets are being reduced and/or replaced by simpler meals (p. 56). Turner-Gottschang, and Reed, (1987) make the following comments about this trend towards economic interests: "On the Chinese side, these exchanges are motivated in large part by a genuine desire to use foreign materials and methodologies to improve the quality of the nation's academic programs. But many, quite frankly, are aimed at generating revenue as well... What this means in practical terms is that prices for services are going up and contractual relations are replacing informal agreements" (p. 71). In spite of the status consciousness of most Chinese, one senior scholar has made the following observation. "China seems to find it difficult at this stage to discriminate among her visitors with respect to their usefulness, seniority, etc. As a consequence, allocations of all kinds seem to be made literally on a first-come/first-served basis" (p. 47).

2.3.2.3 *Interpersonal Relationships*

Although status provides the overall structure of how one relates to Chinese society, day to day relationships are often governed by "guanxi". Turner-Gottschang, and Reed, (1987, p. 51), state "The term 'guanxi' comes up again and again when anyone, Chinese or foreign, tries to discover how to accomplish anything in China. It seems that the bureaucratic structure at times merely provides a framework for the more intangible workings of intricate webs of personal relations and favours". Barlow and Lowe (1985) define "guanxi" as follows. "The term guanxi describes social connections based on concrete, reciprocal exchange of favours and goods among family members and others. In a sense, 'guanxi' is the way people organize relationships outside the 'jia' (family) transforming strangers into kin by extending them favours and incurring obligations... This kind of relationship cannot develop unless both sides accept the obligation to give and receive concrete favours as tokens of the guanxi" (p. 104). "Guanxi" can also be used in unacceptable ways. For example, "students use personal guanxi to get better grades and good jobs and some faculty engage in questionable outside activities" (Turner-Gottschang, and Reed, 1987, p. 74).

Foreigners need to be careful in interpersonal relationships not to make promises they cannot keep or to incur debts (personal favours) they cannot repay. For example, since Chinese students and some faculty wish to study abroad, they may do favours for the foreigner expecting help for their future studies. There are many things a foreigner can do to help, but in most cases they cannot guarantee acceptance to a university or take full financial responsibility for the prospective student (p. 116). Issues

like this need to be clarified before one uses the guanxi of a Chinese friend to get things done.

2.3.3 Doing Research in China

The previous section discussed the importance of good interpersonal relationships for all foreign academics working in China. For foreign researchers these relationships are often essential for the success of their research. Beaver (1984, p. 13) makes the following statements about her experience: "However, our roles as teachers and colleagues gave us the opportunity to interact with students and colleagues and develop friendships, which enhanced both the research process and our living experience". Another scholar reported that "a conference opened new research avenues for him". He also stated that: "... without a doubt, the most useful and rewarding aspect of my sojourn to China so far has been the friends and contacts I have made here and elsewhere in the People's Republic" (Turner-Gottschang, and Reed, 1987, p. 83). Turner-Gottschang, and Reed, (p. 75) make the following comment: "The foreign scholar will be far more successful in China if he or she contributes – whether through lectures, tutorials, or informal English classes – to the modernization effort".

One researcher advises

> others to write to their prospective units as soon as an assignment is made with a detailed outline of the research plan, the kind of materials and equipment needed, and the estimated time necessary to complete the project. It is essential that potential problems be identified and resolved early in the process; misunderstandings encountered once the work has begun can be particularly difficult to unravel in a situation in which the researcher is dependent on a small group of people with whom he or she must interact on a daily basis. (p. 77)

One of the reasons for sending a detailed plan is so that the proper people can be assigned to the research. Usually a team of research assistants will be assigned to be "responsible for making living and working arrangements on behalf of their foreign colleague. If travel is essential to the project, Chinese coworkers take care of the details and at least part of the team accompanies the foreigner to negotiate with other organizations during the trip" (p. 77).

Another reason for sending this report is to give the host institution time to prepare, especially for the initial series of meetings that will take place soon after the researcher arrives. At these meetings the research will be discussed in detail.

> These talks are important for setting the tone of the collaborative effort and for clarifying expectations on both sides. They give the researcher a sense of how the unit views the project and how well it conforms to ongoing research efforts and existing resources. The Chinese side, in turn, forms an impression of the researcher's knowledge of the topic and ability to carry out the project. Veteran researchers urge their successors to be prepared for these discussions with a well-formulated plan – in Chinese if possible (p. 84).

Although these meetings set the tone for the research, one should keep in mind "that no arrangement is predictable, permanent, or self-executing... continuous negotiation with their host unit" is needed (p. 79).

One of the most difficult parts of doing research in China is working with groups outside the researcher's host unit. Turner-Gottschang, and Reed, (1987) describe the problem as follows:

> Barriers among institutions are formidable, and Chinese officials often are hesitant to cross them... As a foreigner, one of your best options is to try to

> understand cadres' viewpoints and the limits of their authority while you seek workable channels to achieve important goals. It takes considerable sensitivity and some time in China to know when to press your requests and when to give up and try another route (p. 76)

Good relationships with Chinese colleagues, especially with one's research team, will be invaluable in helping one find other routes.

2.3.4 Access to Resources

Access to resources is a problem in the Chinese academic system. This section will discuss access to printed materials and computing facilities. In some cases, China may not have the materials. In others, those who need the materials may not have access to them. For example, "some computer science libraries are fairly well stocked with Western and other non-Asian journals and books, although journals invariably lag by six months, the list of titles is thorough, but students are not always allowed access" (Maier, 1986a, p. 4). Turner-Gottschang, and Reed, (1987, p. 104), make the following comment about access to materials. "Your status, work unit, research topic, and approach to problems all determine the limits to access as much as do the particular policies of the library you hope to use". Library work may be slowed down by factors such as the separation of collections and reading rooms "sometimes in different parts of the city" (p. 105), and access to photocopying facilities and catalogs. "Many Chinese libraries do not have workable catalogs or do not make them available to foreign scholars" (p. 105). Many foreign researchers have found that personal collections of Chinese scholars and departmental libraries to be useful sources of materials (p. 105-106).

The following comment made about the situation in 1982 gives some indication that access to computing equipment is more difficult than access to print materials. "The average computer science student in a Chinese university gets little more than 40 hours of computer usage time in his entire 4 year program of study" (D'Auria et all, p. 213). In the next section the use of computers in Chinese information services will be discussed in more detail.

2.4 AUTOMATED INFORMATION SERVICES IN CHINA

In this section an overview of automated information services in China is given with specific reference to the history, organization, and modernization of these services, in relationship to accessing information indexed in North American databases.

2.4.1 The History of Database Services in China

China has a relatively recent history with respect to database services, beginning with research in 1974 (Gao, 1987). In 1976, an experimental system was developed to access magnetic tapes produced in the United States. Since 1983, services of this type have expanded, until in 1987, at least fifty-two foreign databases were being accessed. Several of these databases are available online and others are available in batch mode. For example, in 1983 the Chinese Academy of Medical Sciences began to offer offline retrieval and SDI (Selective Dissemination of Information) for the MEDLARS Database (He, 1986). In 1985, 925 topics were searched offline, which was an increase of 56.3% over 1984, and 2,822 SDI topics were searched, which was an increase of 27.8% over 1984.

Because China's telecommunications system has lagged behind developments in computer technology, offline retrieval and SDI services are the most common domestic database services. Some of these services deliver search results on floppy diskettes, allowing users to process the search results using their own computer equipment. China also has CDROM (Compact Disk Read Only Memory) information retrieval services, which operate much like the batch mode services described above.

Online access to North American databases did not begin until 1980. In that year, nine information institutes from Beijing established a cooperative to search Dialog and ORBIT from a terminal in Hong Kong (Lu, 1986; Zhou, 1987). In 1981, direct connections were made from Beijing using teletypewriters. In 1983, provision for eight 300-baud terminals in Beijing to be connected through a 2400-baud line to Rome was made. In 1983, at least four terminals were used for online information retrieval of ESA-IRS databases. In 1984, this service was expanded to include connections with Dialog and other database vendors in the United States of America through Tymnet and Telenet. With direct access from Beijing, the number of search topics increased dramatically. By the end of 1986, approximately 60 international online terminals had been set up in more than twenty-seven cities and a total of more than 20,000 topics had been searched since 1980 (Zhou, 1987). With recent improvements in telecommunications and more autonomy being given to institutions, it is difficult to estimate the current online use of North American databases.

Lu (1986), points out that promotion has played a significant role in the development of online services in China. Initially promotion was done through meetings of information specialists from the nine institutes in

the cooperative. In 1981, more than twenty specialists attended a three day seminar presented by Dialog. The seminar included an online practice session using a telex terminal. On the third of March, 1982, the Sinhua news agency of China produced a news item about the online search center in Hong Kong. This news item was carried by several newspapers and television stations in China. This provided a platform for the computerized retrieval branch of the China information society in April of 1983 to appeal to the authorities to pay more attention to the development of online retrieval in China. In May of 1983, seminars were held in preparation for the opening of online services with ESA-IRS in July of that year. The annual meeting of the information society and international symposiums on computerized information retrieval provide a platform for information specialists from various parts of China to share ideas. As pointed out in the next section, hands-on experience is lacking. Many people in China know about computerized information retrieval but few have had direct experience. Information specialists of the cooperative found that the best way to convince end users of the superiority of online retrieval over manual methods was to obtain satisfactory results.

The academic community has lagged behind the scientific and technical community in using computerized information retrieval systems. Only recently have these systems been set up in academic institutions. Maier (1986a) states: "Until China's academic communities become familiar with and comfortable with online information technology, it will not penetrate to other sectors of China's economy and society". Zhou (1987) and Lu (1986) make similar statements about the need for the Chinese academic community to become more involved in computerized information retrieval.

2.4.2 Organization of Services

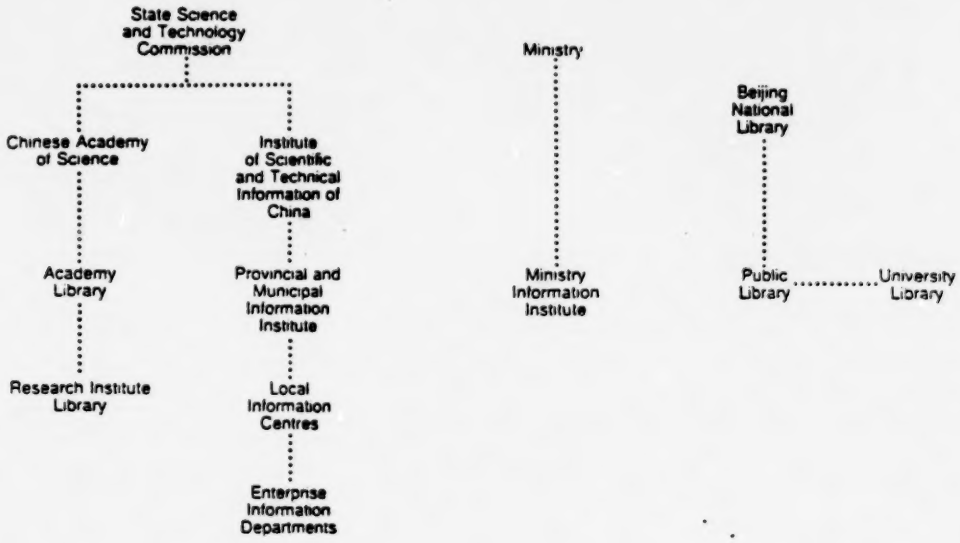
Campbell (1985) makes the following statements about the scope of information services in China:

> At the end of [1985] there were in the country over [1016] higher educational establishments (including the [96] key institutions on which China's modernization programme depends), more than [775] research institutes, 4,000 independent research units, 350,000 industrial enterprises, 52,000 communes (now being transformed into townships) in the rural areas and more than 100 large and medium-sized cities. All of these maintain libraries, reading rooms or information services of various kinds". (p. 26)

Campbell did not mention the more than 100,000 middle and elementary schools. Most of the above services are not automated. Campbell lists the following major information services, most if not all of these are automated to some extent, in Beijing: Beijing National Library, Beijing University, Beijing Normal University, and ISTIC (Institute for Scientific and Technical Information of China); in Shanghai: Fudan University, East China Normal University, and the Shanghai Library; and in Wuhan: the National Information College at Wuhan University. Others also refer to ISTIS (Institute of Scientific and Technical Information of Shanghai) as a major information service.

Barrk (1986) and Zeng (1987) indicate that the structure of information services in China is hierarchical. This structure is illustrated in figure 2.3. Information services related to the Chinese Academy of Science are the most integrated, since they all belong to the same organization. Many informal and some formal links exist between various services at all levels. It is through these links that many Chinese get access to North American information.

Figure 2.3 Structure of Chinese Information Services
(From "Information Policy in India and China" by E. Baark, (1985, January) *Information Development, 1*, p. 19-25.)



2.4.3 Modernization of Services

"Modernization," of course, never operates alone. Defined as a people's development of and response to modern technology, modernization is always interacting with the indigenous cultural values and tendencies. This means that while modernization leads to a degree of "convergence" of all countries, because modern science and technology are international influences subjecting all people to the same stimuli, nevertheless each people must respond in its own fashion, according to its inherited circumstances, institutions, and values. On this basis China's revolution has now led to some convergence of Chinese and foreign elements in a new Chinese cultural synthesis. But do not jump to the conclusion that they are becoming more like us. It can also be argued that under the pressure of numbers and uncontrolled social evils, we are obliged to become more like them. Admittedly the modernization influences on China have

> come thus far mainly from outside, but in the future that we all face together, the balance may someday shift (Fairbank, 1986, p. 8; see Appendix A3 for a summary of Fairbank).
>
> Raising the educational level of the entire Chinese people in order to realize the "four modernizations", an ambitious program to modernize agriculture, industry, national defense, and science and technology by the end of this century, was so important that library development and the role of libraries as a distinct and vital force in the modernization process of the country ... [was] once again recognized (Li, 1986, p. 6.3).

The modernization of information services is not only needed to raise the educational level of Chinese society but also to contribute directly to the "four modernizations" mentioned by Li. For those who need quantitative data to support this argument, Slamecka (1985, p. 8) suggests that one compare the "half-life" of citations found in journals published in a developing country with reputable international journals on the same subject. This comparison can be used to imply that those writing articles for international journals had access to more recent information than their counterparts in the developing country.

Since the need for modernization of China's information services is widely stated (Zeng, 1987; Maier, 1986a, 1986b; Baark, 1985; Campbell, 1985; Lu, 1986), the balance of this section will be used to discuss other issues related to effectively modernizing these services. The following issues for discussion have been extracted from an article by Sun (1985) describing several steps taken in the automation of the National Library of China: training, world wide trends, current practices, technological developments, and planning.

The first step mentioned by Sun was to send young staff for training and to select other staff with experience. Lu (1986) states:

> There are thousands of universities and colleges and hundreds of thousands of research institutes in China. The demand for information is very high. Many users of information have not yet heard of the advantages of online information retrieval. It is important to think about the training of users. It is estimated that there are only about twenty to thirty training seminars for users each year. Now several universities and colleges have courses containing a portion of online information retrieval training - but it is very elementary... At the present training seminars, there is little chance for the students to practice online retrieval techniques due to a lack of training files and system training passwords (p. 132).

Li (1986, p. 6.9) indicates that an information retrieval course should be one of ten core courses for library and information science students. This course would teach the manual searching of printed indexes. Some universities' courses teach online information retrieval; for example, Wuhan university gives students practice in online searching by using a simulation program. In summary, in order to modernize information retrieval services in China, end users need to be trained in the advantages of computerized information retrieval and information specialists need to practice using computerized information retrieval equipment as part of their training.

The second step mentioned by Sun (1985) was to investigate international trends in library automation. Slamecka (1985, p. 9) indicates that one of these trends is a shift to designing systems for the end user. The shift has been a shift from "designer-king" to "user-king". He also points out that traditionally, systems have been designed for the information specialist rather than the end user. He suggests that "problem solvers' [end users] interaction with data and information has both a different purpose and a different form from those of the librarian/bibliographer, partly because they are occasional users, partly because to them the information activity is ancillary, not central." (p.

10) Systems need to be flexible in their design to accommodate both types of users, especially to anticipate an increase in end users. Slamecka further indicates that "the management of the public information utility needs to shift from being representative and prescriptive to being democratic and participatory." (p. 11) Zeng (1987) indicates that China needs to move in this direction in developing its information services. Another trend mentioned by Slamecka is the increase in cost-effectiveness of the technology, especially in the area of microcomputers. Xu (1985) points out that most information organizations in China are developing microcomputer systems. Some of these systems use the latest technological developments such as CDROM's and WORM's (Write Once Read Many). A third trend mentioned by Slamecka (p. 11) is that software is being designed that allows users to use sophisticated computer programs without the aid of computer programmers. Zeng (1985) makes specific reference to "information systems tending to be more user-friendly, and ...[expert] system like". In many cases China is not taking advantage of this new software but is programming its own software. Another trend mentioned by Slamecka (p. 12) is new developments in telecommunications and networks that have opened up access to new information services such as electronic mail, computer conferencing and online databases. China has a great need in this area and is seeking solutions to their problems (Maier, 1986a, 1986b; Zeng, 1987). Zhou (1985) discusses the merits of purchasing database tapes and setting up one's own online service compared with searching foreign databases directly using an international network. Zeng (1985) indicates that the Beijing document services aims at developing an integrated retrieval system, in terms of a national network, online services and other types of information services. Slamecka (1985) indicates that compatibility in a network system is attained by the

adoption of standards. Zhou's (1985) "Design Study of the National Retrieval System of Scientific and Technical Information" suggests a standard format for bibliographic information. He further suggests that in operating provincial database services, the same model of computer and database management system should be used. He also points out the need for coordination of programs at the national level. "Difficulties in coordination lead to some overlapping among services, but, more seriously, also tend to create several independent networks whose resources are difficult to pool in the event of modernization of the information infrastructure" (Baark, 1985, p. 20). Baark suggests the following options for use of advanced information processing and communications equipment.

> One option is to locate facilities for access to international databases in one national centre and significantly enhance the efficiency of delivery services from this centre... Another option would involve several regional or sectoral centres... Both options would, however, require substantial user-oriented services. Most likely it is the linkage with users, not the establishment of computer networks, which will become a critical point in the process. (p. 25)

China is using both options but tends toward using the national center option.

The investigation of international trends should be used as inspiration for the development of one's own model or system, not to find models or systems to imitate (Baark, 1986 and Rustic, undated). Baark indicates that modernization should not be viewed simply as "catching-up" to the "West" but rather the functions of current information services need to be reviewed and technology selectively introduced. This type of "review should also indicate where conditions are beyond the control of information services, as in instances where motivation on the part of the

users is lacking." (p. 23) A review may also indicate that introducing new technology to process larger amounts of information faster will not improve information service significantly. Technology that emphasizes "the analysis and consolidation of information" may be more useful than the ability to process more information faster. (p. 24) In some cases the problem may not be a technical, one but rather "the impossibility of overcoming the barriers created by inter-organizational competition and dispute may render any effort of reorganizing information services a hopeless task" (p. 23). Maier (1986b, p. 108) points out that one thing China needs to review is their classification system. An example of the type of review mentioned by Baark is Sun's (1985) investigation of manual procedures in the National Library of China to study the feasibility of computerization and to find out what preparations were needed.

The next step described by Sun was to survey state-of-the-art developments in "hardware and software, including the processing of Chinese characters". With respect to hardware, Maier (1986b) reports that installations in Chinese universities "are sufficient for immediate needs". (p. 107) With respect to software development he states: "China still lacks broad experience in management of nonscientific applications design, specification, development, implementation, and maintenance." He also indicates that they need to gain knowledge in "how to successfully transfer new automation procedures into old organizational structures". (p. 107) Maier further states, "To China's benefit there is now a wealth of literature and experience on which to draw, and well-established library automation techniques and standards [which] will save China's library automation teams time and effort". (p. 107) The researcher has observed that many information services are not taking advantage of this

wealth of literature and experience, whether it be of Chinese origin or comes from abroad. With respect to the processing of Chinese characters, Maier (1986b) and Zeng (1986) indicate that there are several solutions to this problem.

The last step implied by Sun (1985) was the implementation of initial systems while planning for future systems. Sun states the long term target of the National Library's automation program and then lists several specific tasks the library is attempting to accomplish. The researcher has observed that where this step has been neglected, a partial system with limited usefulness is often implemented.

2.5 SUMMARY

China's historical background makes its current modernization efforts more difficult than it is for many other countries. Although technical modernization is well underway, the modernization of education is just beginning. If China wishes to create a technically modern society, the modernization of education is essential. In order to do this China will need to provide their academic community with better access to North American information. This necessitates the modernization of academic information services. In this Study a model is developed to assist in this modernization effort.

This model is based on The Researcher's Model presented in the next chapter, The Independent Research Project Presented in Chapters Four and Five, and the CCERIC (Chinese Computerized Educational Resources Information Centers) Pilot Study Plan found in Chapters Six. The

resulting Cooperative Information Systems Model is presented in Chapter Seven.

Chapter Three

A Conceptual Presentation of the Model

3.1 OVERVIEW

Chapters One and Two of this Study are a descriptive introduction to the study and the context in which it took place. These chapters also served as a resource for the development of the model presented in this chapter (which is referred to in this Study as "The Researcher's Model"). Three levels of detail are used in The researcher's Model: the first is presented in the introduction below, the second is presented in the balance of this chapter, and the third is a checklist, which outlines the content of this chapter and adds additional quotations from some of the studies used to develop the model (see Appendix A4). The model is used to assist in data analysis (Chapters Five), as a guide for developing a Pilot Study plan (Chapter Six), and as a basis for The Cooperative Information Systems Model (Chapter Seven).

3.1.1 An Introduction to The Researcher's Model

The Researcher's Model represented in figure 3.1 was developed to be used as a guide for planning and implementing innovations. It was developed specifically for this study and was used as a guide for data analysis, plan development, and model building.

The core of the model represents the following stages of the innovation process:

1. In the *Needs Analysis* stage, priority needs, whether real or felt, are identified for further investigation.

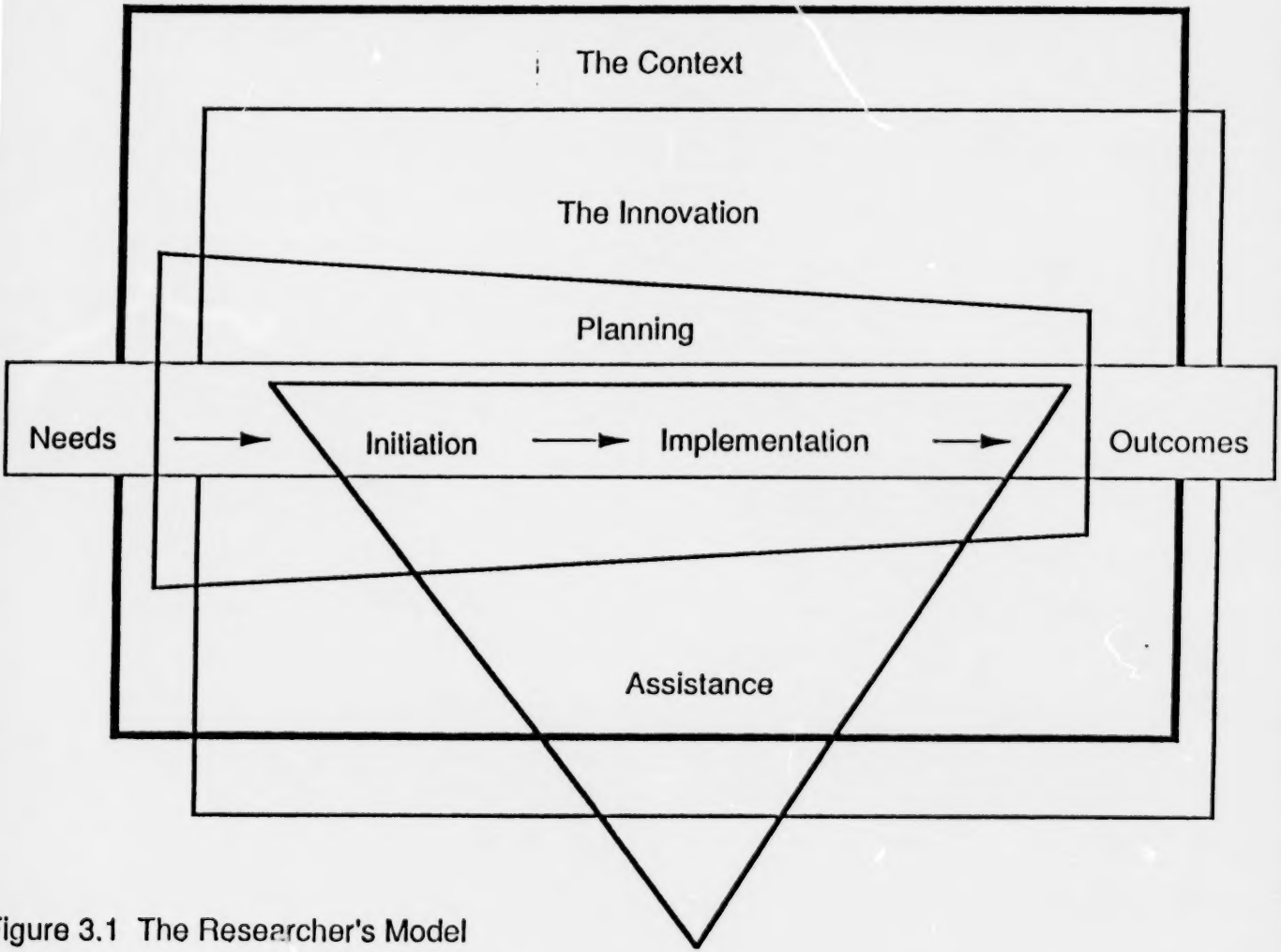


Figure 3.1 The Researcher's Model

2. Initiation *is divided into two stages. The first is* the *Preadoption* Stage, in which initial planning takes place to further clarify the need and determine which solution(s) best meet the need. In most contexts this involves proposal writing. The second is the *Preimplementation* Stage, in which plans are made to implement a specific innovation. The innovation usually needs modification and/or further development prior to and during implementation.

3. In the *Implementation* stage, *Early Implementation* is distinguished from later implementation in that early implementation usually needs different strategies and plans than later implementation, because the innovation and its use are usually not fully developed at this stage. Also stabilization of use in a specific context takes time to achieve. During *later implementation* wider adoption of the innovation and a settling often take place, leading to Institutionalization and other outcomes.

4. In the *Outcomes* stage intermediate outcomes are distinguished from final outcomes. Intermediate outcomes are realized throughout the implementation stage. Once Institutionalization is reached final outcomes can be assessed and The Innovation Process is complete.

The model can be used differently at different stages of The Innovation Process. In the early stages prior to an adoption decision, it can be used to examine potential innovations in the light of the context in which they will be implemented to clarify what the specific needs are and to select the most appropriate innovation. The model is most useful in preimplementation planning to ensure an optimal contextual fit and provision of sufficient Assistance to overcome difficulties encountered in early implementation. The model can also be used as a guide during later implementation to produce institutionalization of desired features of the innovation and other desired outcomes.

As indicated in figure 3.1 several other factors interact with the innovation process and need to be considered by those involved with this process. Planning as indicated in figure 3.1 is also a process that runs parallel to and is an integral part of the innovation process. As indicated in the diagram, the amount of planning usually decreases as the innovation process progresses. All of the other factors, The Innovation,

The Context and Assistance relate to these processes as indicated in the figure. The major factors presented in figure 3.1 are expanded into a more comprehensive list as follows:

Factors Related to Needs

1. Identification
2. Prioritization
3. Clarification

Factors related to Initiation

4. Consideration of Innovations
5. Consideration of Other Factors

Factors Related to Implementation

6. Use of Materials
7. Other Activities and Practices
8. Beliefs and Understandings

Factors Related to Outcomes

9. Stabilization
10. Dissemination
11. Institutionalization
12. Direct Impact
13. Indirect Impact

Factors Related to The Innovation

14. Complexity to Implement
15. Innovation Scale/Scope
16. Demand on Resources
17. Usefulness
18. Contextual Fit

Factors Related to The Context

19. Physical Conditions

20. Social Organization

21. Influence

22. Cooperation

23. Motivation and Attitude

24. Change

25. Economics

26. Other Contextual Factors

Factors Related to Assistance

27. Monitoring

28. Resource Acquisition and Utilization

29. Training and Skill Development

30. Networking

31. Administrative Latitude

Factors Related to Planning

32. Policies

33. Strategies

34. Operational Plans

Innovation developers, planners and implementers need to carefully consider the factors presented above in order to produce optimal outcomes from implementing an innovation. In this Chapter the above mentioned factors are treated as separate yet related entities. In reality they are integrated as indicated in figure 3.1 and need to be considered in relationship to one another. Prior to a presentation of the model as outlined above, a description of the development of the model is presented.

3.2 DEVELOPMENT OF THE MODEL

Conceptually The Researcher's Model is a general model for planning and implementing educational innovations in a variety of contexts. It has been developed by integrating concepts from other studies with the Researcher's experience. Experientially it has been applied to concepts presented in this Study. Development of the model has occurred throughout the research related to this Study.

Prior to engaging in The Independent Research Project described in Chapter Four, the author had a general concept that the characteristics of an innovation should be carefully studied in conjunction with the context into which it will be implemented. This general concept was expressed by referring to general principles such as those stated by IDRC (see statements three and four in Appendix A1) or the research questions relating to The Independent Research Project mentioned in Chapter Four. Throughout the research related to this project, other concepts evolved but were not explicitly stated.

In the process of writing Chapters One and Two of this Study several concepts related to the model were explicitly stated. For example, the following cultural and social factors are described in Chapter One: language, economics, social organization, and social and technological change; and in Chapter Two the following issues are discussed: training, world wide trends, current practices, technological developments, and planning. The model presented in this chapter emerged as the Researcher attempted to integrate these concepts with concepts presented by Fullan,

Miles and Anderson (1988). The concepts of Fullan et al. are referred to in this Study as "Fullan's Model".

The basic model presented in this chapter was a result of integrating concepts from three diverse studies. Huberman and Miles (1984) studied new educational programs; Fullan et al. studied "New Educational Technology"; and the Researcher studied new information systems. Not only does the diversity of the innovations represented in these studies make them suitable sources for developing a general model but also the diversity of the populations studied. Huberman and Miles (1984) studied the implementation of 12 different programs in 12 different school districts in 10 widely scattered states of the United States. Fullan et al. (1988) studied the implementation of one major program representing many technological innovations in the public schools of one Canadian province. The Researcher studied one university and visited several other sites in the People's Republic of China. The three studies are also diverse in the methodologies used. Huberman and Miles (1984) did an extensive comparative analysis of the implementation of 12 innovations, using modified ethnographic techniques. Fullan et al. (1988) interviewed key people and analyzed existing studies. The Researcher used a case study and interviews. The diversity of these studies provides a good source of information for developing a general conceptual model for the implementation of educational innovations. Two other studies, Havelock and Huberman (1977) and Wilson (1981), were also used to check the international applicability of the model and to strengthen various parts of it.

As mentioned in Chapter Four, the Researcher's Model was developed through "Theory Sampling". Other models and studies such as Rogers (1983) were briefly reviewed to see if any relevant theories had been omitted. Although the researcher has determined that, for the purposes of this Study, further theory sampling would not make a significant difference; it is needed to improve the generalizability of the model. The following models were reviewed:

1. The problem-solving model; the social interaction model; the Research Development and Diffusion model; the Linkage Model; the Concerns Based Adoption Model (Overview by Rutherford, 1977); the Individually Guided Education model (as analyzed by Barrows, 1980).

2. The Responsive Model of Educational Improvement; Organizational Development in Schools; the Linkage Model; and the Change Agent Study Model (as summarized by Wilson, 1982).

3. Models developed by Lindquist and by Berg and Ostergren (as analyzed by Mathias and Rutherford, 1983).

A review of the above mentioned models indicated that the studies on which The Researcher's Model is built had considered the major factors presented in these models.

The Researcher's Model has been further refined through use in this Study (see Chapter Six).

3.3 THE INNOVATION PROCESS

In this section several views of The Innovation Process are presented as background to the view represented by The Researcher's Model.

Havelock and Huberman (1977) state that "it is important to think of the process of innovation simultaneously in five somewhat different ways:"

1. As a *sequence of events* over time, beginning with the first recognition of the need for and the possibility of change and ending with the complete installation and acceptance of that change;

2. A set of *people and institutions* who are tied together in some way as the creators, planners, implementors, decision makers and users of the innovation;

3. A series of *transformations* of ideas and resources into materials, practices, institutions, and actions;

4. A *problem-solving sequence* in which needs are recognized and defined as problems and in which solutions are subsequently discovered and applied to those needs, leading to their satisfaction; [see figure 3.2] and

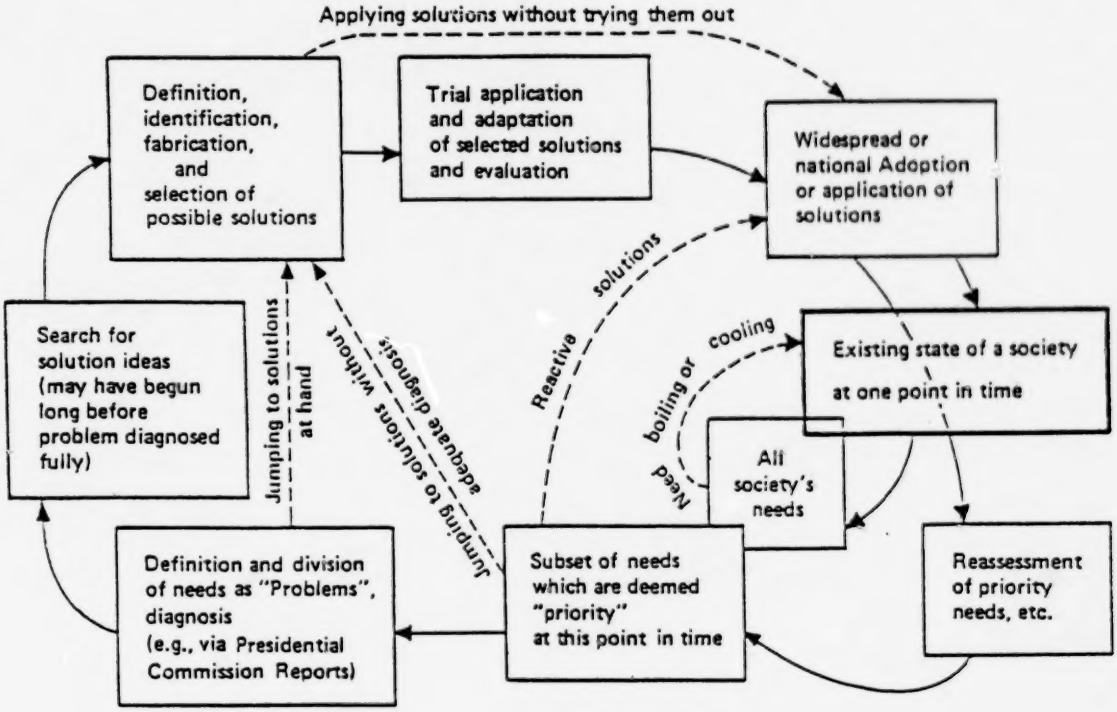
5. A *temporary system* which [sic] is (a) composed of many integrated elements, a system which has (b) recognizable input, throughput and output subprocesses, a system (c) composed of people and institutions, organized usually on a temporary basis, to get the task done, finally (d) a system of functions and actions interrelated to solve problems around a focal need area. (p. 34)

Wilson's (1981) concept of The Innovation Process is represented by the following sequence of steps related to the transfer of an institution or innovation from one context to another.

1. Need Identification
2. Selection
3. Planning
4. Transfer
5. Perception
6. Implementation
7. Modification
8. Utilization
9. Adaptation to Changed Reality (p. 138)

Huberman and Miles (1984) present a similar list in reference to the implementation process:

Figure 3.2 Alternative paths in the problem solving cycle. (From *Solving Educational Problems: The Theory and Reality of Innovation in Developing Countries* by R. G. Havelock and A. M. Huberman, 1977, p. 139.)


Applying solutions without trying them out
Definition, identification, fabrication, and selection of possible solutions
Trial application and adaptation of selected solutions and evaluation
Widespread or national Adoption or application of solutions
Search for solution ideas (may have begun long before problem diagnosed fully)
Jumping to solutions at hand
Jumping to solutions without adequate diagnosis
Reactive solutions
boiling or cooling
Existing state of a society at one point in time
Need
All society's needs
Definition and division of needs as "Problems", diagnosis (e.g., via Presidential Commission Reports)
Subset of needs which are deemed "priority" at this point in time
Reassessment of priority needs, etc.

1. Adoption of the Innovation
2. Views of the Innovation: Initial Perceptions and Assessments
3. Early Implementation
4. The Role of Assistance
5. Later Implementation

Fullan et al. view the implementation process as it relates to the innovation process as follows:

> First, implementation is a developmental process of change for teachers attempting to use an innovation, which can

> involve alterations in materials, instructional practices and beliefs about the teaching/learning process. Second, implementation is the second phase in a three-phase process of innovation - initiation (mobilization, adoption), implementation and institutionalization (continuation, incorporation). Third, the mutually reinforcing, and the strategic importance and activities associated with any one factor can vary at different phases in the overall process. (p. 19)

In The Researcher's Model, The Innovation Process is viewed as a four stage process: Needs Analysis, Initiation, Implementation, and Outcomes. This process is affected by factors related to The Innovation, The Context, Assistance and the Planning process (see Figure 3.1). In this section, factors related to the stages of The Innovation Process identified above are discussed. This is followed by a discussion of other factors.

3.3.1 Needs Analysis

The best representation of the relationship of needs to the innovation process is found in figure 3.2. The creation or implementation of an innovation is the result of some form of needs analysis, whether that analysis is accurate or not or whether the need is real or perceived. It stands to reason that the more accurate and thorough the needs analysis the better chances there are for the other stages of the innovation process to be successful. Need analysis should involve: an identification, prioritization and clarification of needs.

As indicated in figure 3.1, needs are often identified from within a context but sometimes may be identified from outside the context in which an innovation is to be implemented. For example, a government official

from a developing country may see an innovation in a developed country and determine that a specific context in his country needs that innovation.

Since no context has sufficient resources to address all the needs of its community, it is important to prioritize needs before investing further resources in the other stages identified below. Some needs are obvious and urgent while others may be of higher priority because of their long-term effects. Determining the priority of a need is also important so that sufficient assistance can be obtained for successful implementation. Using the example above, the government official returns to his home country with his recommendation to implement the innovation he saw. His colleagues question him as to how much it will cost and where the funding will come from. The official is able to convince his colleagues that he can find the funding and that the cost is not too great.

The prioritization and clarification of needs go hand in hand. For example, the government official mentioned above is also questioned by his colleagues on the usefulness of the innovation in the context he has in mind. They further discuss their concerns with officials within the context to seek further clarification.

Although needs analysis is not as simple as presented above, it is important to the innovation process and often continues throughout that process.

3.3.2 Initiation

Initiation refers to "those activities which precede the actual use of an innovation" (Burrows, 1980). In the initiation stage possible innovations are considered in relationship to the Context and potential needs for Assistance. A decision to adopt a specific innovation is made and plans developed to implement it.

Prior to the decision to adopt a specific innovation several possibilities are usually considered. These may be existing innovations or they may be proposed innovations. In some cases pilot tests of several innovations may take place.

During this stage it is important to consider all of the other factors identified in The Researcher's Model so that an appropriate adoption decision can be made and that preimplementation planning is most effective. Factors related to implementation and outcomes should be considered in terms of their potential effect.

3.3.3 Implementation

Implementation refers to the use of an innovation and all activities related to its use, prior to institutionalization. In discussing the use of an innovation Fullan et al. (1988) ask the question "What types of things would have changed in the classroom if NET [the innovation in their study] were to be implemented?" (p. 3.1). Implementation usually involves the use of new materials, changes in activities, practices, beliefs and understandings.

The implementation of an innovation usually involves the use of new materials and new uses for existing materials. Huberman and Miles (1984) make reference to "User practice mastery, skill" (p. 190), which is closely related to the use of materials. Fullan et al. (1988), refer to "the use of new hardware and software materials" (p. 3.1). In other words, how are the innovation and related materials being used? This question is rather easy to answer in that materials are concrete and tangible and thus their use can be observed and measured.

Implementation also involves "the use of new activities (including grouping) behaviours or practices" (Fullan et al., 1988 p. 3.1). Huberman and Miles (1984) refer to the following "changes in the users' practices and attitudes: changes in everyday classroom routines and expansion of instructional repertoires, changes in interpersonal ties, cognitive growth, shifts in attitudes toward pupils or peers, shifts in professional self-image, and transfers of innovation-specific skills to other parts of the user's practice." (p. 274). Changes in user practice are not only related to activities directly related to the use of the innovation but also to other activities that are affected by its use. Although these activities and practices are more difficult to observe and measure than the use of materials, they may have a greater impact on the overall effect of using an innovation.

Some of the changes identified above relate to beliefs and understandings. The question one needs to ask is "What are the changes in beliefs and understandings that take place as a result of using the innovation?" An innovation is a new idea and will require users of the innovation to gain

new understandings and perhaps new beliefs in order for it to be successfully implemented. In The Preadoption Stage, mentioned above, the effect of implementing an innovation, on beliefs and understandings needs to be clearly understood by those making the decision to adopt the innovation. This may mean that the innovation needs to be modified to conform to important beliefs and understanding or another innovation adopted. Both Fullan et al. (1988) and Huberman and Miles (1984) indicate that in the early stages of implementation understanding of an innovation is unclear and clarity needs to be developed if implementation is to be successful. The effect of beliefs and understandings on implementation is the most difficult to measure but also may be the most important. Several of the factors discussed below will influence beliefs and understandings.

3.3.4 Outcomes

Outcomes refer to the results of implementation. Final outcomes are measured when institutionalization occurs, that is the use or nonuse of the innovation has "become organizationally routine" (Huberman and Miles, 1984). Fullan et al. (1988) make general reference to "learning and other outcomes" but do not present a specific list. Huberman and Miles (1984) developed the following list of Outcomes:

In relationship to the innovation

1. Stabilization of use: the degree of practice mastery and "settledness" of the new practice in the users' instructional repertoire. We have already reviewed this outcome as the last stage of later implementation.

2. Percentage of use: the number of users in a school or district in proportion to the number of "eligible" or possible users. (This is, in effect, a measure of the spread or internal diffusion of the innovation: how widely it was being used by those who could potentially use it.)

3. Institutionalization: the degree to which the innovation was "built in" - incorporated into the ordinary structures and procedures of the school and its surrounding district. By this, we do not mean sheer "continuation," which might have occurred, for example, if a key administrator willed it - but the presence of indicators that the innovation had become organizationally routine.

In relationship to people

4. Student impact: achievement and affective and behaviourial changes in the students as a result of exposure to the innovation.

5. User capacity change: changes in users' knowledge, attitudes, or skills that were of general professional value, beyond the immediate innovation's requirements. (The idea is of increased capability, strength, and development as a professional.)

6. Job mobility: the movement of school personal to new positions, either inside their schools or districts (down, sideways, or up), to new positions outside their districts, or out of education altogether. (p. 187-188)

With respect to job mobility they comment that some used the innovation to gain promotion, while others "burned out" or became discouraged and sought new jobs elsewhere (p. 188).

The above list has been generalized to produce the following list of outcomes:

1. Stabilization

2. Dissemination: the meaning is similar to percentage of use but broader.

3. Institutionalization

4. Direct Impact: refers to the impact of the innovation on the intended target. In most educational innovations the target is student change.

5. Indirect Impact: refers to other outcomes such as user capacity change and job mobility.

Huberman and Miles (1984) identify the following "levels and patterns of outcome":

1. High outcomes from enforced, stabilized use
2. Moderate-high outcomes from high mastery and low settledness
3. Moderate-low outcomes from program blunting and downsizing
4. Failing: low outcomes from indifference and discouragement

In planning for implementation one could use the above lists to anticipate potential outcomes and insure that the level of outcome is maximized.

3.4 THE INNOVATION

An innovation is "a deliberate, novel, specific change, which is thought to be more efficacious in accomplishing the goals of a system" (Miles, 1964, p. 14). Characteristics of an innovation will influence its implementation. For example, some innovations are minor changes in current practice and thus relatively easy to implement. Others are complex concepts that are not clearly defined, and therefore they are hard to implement. Fullan et al. (1988) identify the following factors which relate to the characteristics of an innovation: "Clarity and complexity, Consensus/conflict about the change, [and] Quality and practicality of the change." (p. 3.4). Huberman and Miles (1984) list the following properties of an innovation: "Innovation scale/scope, Program demand characteristics, Implementation requirements, Program-district fit, Program-building fit, Anticipated classroom change, and Anticipated organizational change" (p. 190).

The following factors identified by the Researcher are discussed: Complexity, Innovation Scale/Scope, Demand on Resources, Usefulness, and Contextual Fit.

3.4.1 Complexity

Havelock and Huberman (1977) refer to complexity of an innovation as follows:

1. The number of parts there are in the innovation;
2. The number of behaviours or skills to be learned or understood before adoption is possible; or
3. The number of procedures required for effective maintenance over time. (p. 159)

Fullan et al. (1988) make the following comment with respect to complexity:

> Some educational innovations are more complex to implement than others. For individual implementers, innovation complexity arises from the number of components of practice affected, the degree of difference from existing practices, materials and beliefs, and the difficulty of learning to make the necessary changes. While more complex innovations requiring major changes are harder to gain clarity about and more difficult to implement, they are also more likely to yield non-trivial results than innovations which demand less personal effort and organizational support. (p. 3.5, 3.6)

Fullan et al. make the following comment about "clarity": "In order for implementation to succeed, implementers have to gain a clear understanding of what to do and change in order to put the innovation into practice" (p. 3.5). As implied by Fullan et al., complex innovations are usually large in scale and/or scope.

3.4.2 Innovation Scale/Scope

Innovation scale/scope is used, in The Researcher's Model, to refer to the size of an innovation. Size is often related to complexity to implement and demands on resources but not necessarily so. For example, a large scale project may be phased in over a period of time with

relatively little complexity and additional demand on existing resources. On the other hand, a small scale project may be very complex and create large demands on existing resources.

3.4.3 Demand on Resources

The demand of an innovation on existing resources is the primary consideration of this factor. These resources include time, materials and emotional energy. Some projects add resources (usually obtained from external funding) and create little demand on existing resources. Others demand a great deal of additional resources to implement.

3.4.4 Usefulness

Fullan et al. (1988) refer to this as "quality/practicality". The more useful an innovation is the more likely it will be successfully implemented. Ultimate usefulness of an innovation needs to be demonstrated by immediate usefulness of some features of the innovation. Usefulness is also affected by the presence or absence of practical steps for implementation. In some cases innovations designed for one context may not be as useful in another context.

3.4.5 Contextual Fit

Wilson (1981, 138-139) states that an "essential condition [for the transfer of an institution or innovation] is the 'fit' of [the] innovation or institution into its related, or linked, institutions or innovations. Huberman and Miles (1984) discuss "contextual fit" of an innovation at two

levels, that of the district and that of individual buildings or schools. Fullan et al. (1988) also discuss fit as it relates to the ministry of education. If a poor fit exists, then either the context or the innovation or both need to be modified. In making modifications to the innovation one needs be careful not to limit the ultimate usefulness in order to produce a good fit.

In examining contextual fit one needs to look at what an innovation displaces, complements and is in competition with. One needs to examine how barriers, and constraints found in the context, that would inhibit implementation, can be overcome. One also needs to consider what contextual elements can be used to assist implementation. In most cases, especially in cross-cultural implementation, contextual factors need to be given careful consideration.

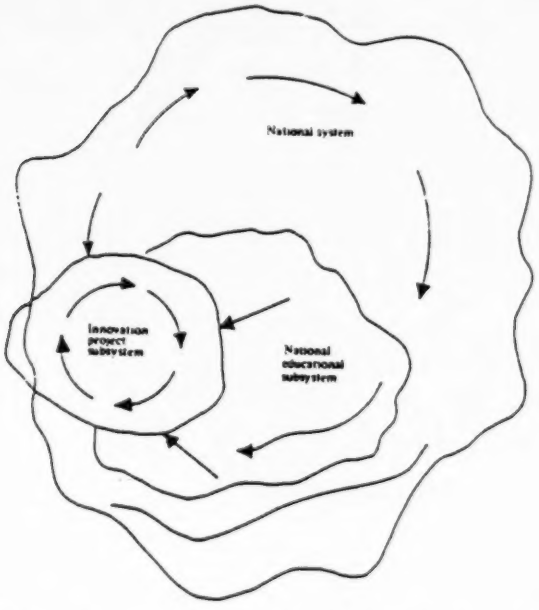
3.5 THE CONTEXT

The Context is anything, including people, organizations, relationships and physical conditions; that influence or are influenced by the implementation of an innovation. Havelock and Huberman (1977) present the following warning related to the context in which an innovation is being implemented:

> A Viable Social System Is A Miracle: Innovators Be Humble! The wisest experts on change process warn us to respect the existing scheme of things, especially if it works and seems to be serving the psychological, social and material needs of its members at some level of satisfaction. There are at least two reasons for such caution: (a) the system may not need you as much as you thought and (b) you might do more harm than good by weakening or destroying delicate social institutions which were functional in ways you never guessed. (p. 23)

One of Havelock and Huberman's (1977) views of the context of an

Figure 3.3 A view of an educational innovation project subsystem in context.
(From *Solving Educational Problems: The Theory and Reality of Innovation in Developing Countries* by R. G. Havelock and A. M. Huberman, 1977, pp. 35.)



educational innovation is summarized in figure 3.3. Huberman and Miles (1984) make the following comments with respect to context:

> As our model indicates, educational innovations are not introduced into a vacuum. School people have gradually built up a history of relationships among themselves, and with the institutions they work in. Each educator builds on that history as a function of his or her personal set of goals and career trajectory. This process makes for a complex, sometimes tangled web of relationships initially invisible to the outsider. That web can be intensified or shifted when an innovation enters the scene. With the innovation often come added funds, possibilities for promotion, opportunities to resolve nagging problems, chances for professional growth, and revision in patterns of institutional influence. (p. 43)

They classify "contextual factors" into two categories, "contextual antecedents" and "contextual influences" (p. 190). Some of these

contextual "antecedents" and "influences" were present in some contexts but not in others. The following "Local Conditions" identified by Fullan et al. (1988) relate to the contextual factors discussed in this section:

1. Central office direction, commitment and support
2. Principal's leadership
3. Community support
4. Environmental stability (p. 3.4)

Since the contextual factors identified above are context specific, the factors presented below were derived from the more general concepts discussed as Cultural and Social Factors in Chapter One of this Study with the addition Physical Conditions and Philosophical Approaches.

3.5.1 Physical Conditions

The physical setting of the context in which an innovation is implemented will affect how implementation takes place. Havelock and Huberman (1977) examined geographical barriers to innovation, "which included 'long distances', 'slow transport', 'isolation' and 'poor climatic conditions'" (p. 222). Other items related to the physical support structures of a context would be included in this factor. Physical conditions are sometimes related to Philosophical Approaches.

3.5.2 Philosophical Approaches

Based on Holmes (in press) the following philosophical approaches to innovation have been identified:

1. The *technocrat* will market an innovation to a particular context and provide training in how to implement the innovation.

2. The *therapist* will use expert opinion and therapeutic skill to modify the innovation and "help" users adjust to the innovation.

3. The *socialist* will modify the innovation and implement it in accordance with the goals of the state.

4. The *traditionalist* will modify the innovation and implement it through established channels in accordance with traditional values.

For illustrative purposes let us assume the new innovation to be a new sex education program that includes sexual orientation as part of the content. The technocrat will examine the program to see if it is marketable and make modifications accordingly (usually a rephrasing of the content). A training program and implementation strategy would be developed emphasizing methodology. The therapist will examine the program to ensure that it is consistent with expert opinion and therapeutic practice and develop a strategy to "help" teachers to introduce the program in a "therapeutic" manner. For example, if all sexual orientations were not treated as equally valid then the program would be revised and expert opinion given explaining the validity of all sexual orientations. The socialist will examine the program in view of its usefulness in achieving the goals of the state. The program would be modified and implemented in accordance with state policy. For example, in China birth control and the one-child policy would be stressed. Traditionalists will examine the program in light of traditional values and modify it accordingly. Although traditionalists delegate the implementation of a program to the individual teacher, they insure that traditional values are upheld by selecting teachers who model these values.

What the technocrat, therapist, and socialist have in common is the imposition of the values of an elite in order to implement immediate

change within a given context. Traditionally change takes place over a longer period of time through recognized authorities who hold to traditional values (especially moral and ethical values).

It is not intent of The Researcher's Model to support a particular philosophical approach but rather to identify a list of factors for examining the innovation process from a variety of philosophical approaches. People with different philosophical approaches will likely emphasize different parts of the model. The technocrat will likely emphasize the innovation, the traditionalist the context, the therapist the innovation process and the socialist the planning process. Philosophical approaches have a significant effect on Social Organization.

3.5.2 Social Organization

Havelock and Huberman (1977) refer to social organization in terms of "historic", "Socio-Cultural", and "Political" barriers to innovation. With respect to historic barriers they indicate that the colonial education system was considered the most serious (p. 224). The most significant socio-cultural barrier was "conflict among ideologies about change" (p. 225). Although political barriers were perceived as the least serious by respondents to their survey, other data indicated these responses to represent "only the tip of an iceberg" (p. 225). They felt there was a reluctance to discuss political issues. In this model historical and political issues are considered within the broader context of social organization.

The organizational structure of a context and how people relate to one another will affect how an innovation is implemented in a specific context. The structure of the context, how people influence and cooperate with each other, all affect implementation.

Differences in *organizational structures*, which are found in different contexts within a culture are magnified when one compares contexts cross-culturally. For example, the organizational structure of the Chinese educational system (see Chapter Two) is very different from the North American system. Differences between one context and another need to be given priority consideration when implementing an innovation cross-culturally. Different organizational structures will facilitate or hinder the influence of individuals and organizations.

The degree of *influence* individuals and groups have on each other and the way which it is exercised will also affect how an innovation is implemented. Havelock and Huberman (1977) define people who are influential in innovation as "innovators... who first proposed the solutions [to problems] and those – often but not always the same – who convince national authorities of its pertinence and practicability in meeting the needs" (p. 124). They also indicate that the role of educational innovators is "not to *invent* but rather to *adapt* solutions to specific situations... [mostly] from outside the educational system itself... [and in developing countries] from *outside the* country *as well*" (p. 124). They identify the following "*types of innovators... The senior university professor or administrator... The ministry official... The political adviser... The foreign expert*" (p. 125-126). The decision to adopt an innovation is usually made by someone who has considerable

influence in the organizational structure (Huberman and Miles, 1984, p. 55). The influence of administrative personnel, especially the administrator in charge of the unit (the school principal or the chairman of a university department) in which the innovation is being implemented, is also a key factor during the actual implementation phase. Both Huberman and Miles, and Fullan et al., (1988) refer to "administrative pressure" as an important influence on implementation. This pressure can have a positive or negative effect depending on how it is exerted and on how much assistance is given to respond to the pressure (see the section on assistance below).

Fullan et al. (1988, p. 3.89) and Havelock and Huberman (1977) indicate that community involvement may be a significant source of either positive or negative influence.

In order for most innovations to be successfully implemented, influential people and groups usually need to cooperate. With respect to *cooperation* Huberman and Miles (1984, p. 190) refer to "Teacher-administrator harmony" and Fullan et al. (1988, p. 3.21) make reference to "consensus/conflict". With respect to international cooperation Hayhoe (1989) proposes that:

> [For] a project of cooperation in China, an ideal of mutuality might take the following form. Aims and patterns of organization are set by joint agreement from both sides. Foreign participants gain a deep and genuine understanding of Chinese scholarly culture and participate in intelligent dialogue over the differences between it and their own theoretical perspectives. Networks of interaction among Chinese participants in the project and between them and their fellows in other institutions ensure a critical re-interpretation of the new theory and techniques being introduced. Chinese discoveries and contributions in the field are in turn integrated into the dominant paradigm, modifying its direction. A good library is built up, representing a balanced collection of foreign and Chinese materials with a translation policy that facilitates the transfer of ideas both ways, and the creation of some kind of synthesis. (p. 134-135)

Assistance in developing cooperation is discussed under networking below. Sometimes cooperation is affected by people's motivation and attitude.

3.5.3 Motivation and Attitude

"Users, like administrators, had multiple motives for adopting an innovation... The prime motive for *user's* adoption was *administrative pressure*" (Huberman and Miles, 1984 p. 57). Other incentives were related to "professional growth" or improvement of the existing situation. "*Administrators focused* on the potential of the innovation to *improve classroom instruction* and schoolwide *management*... An implicit incentive was that of gaining *access to funds*" (p. 57). Neither users nor administrators were strongly motivated by the potential of the innovation to solve existing problems. Both were motivated by "career plans" either to secure "their present status" or get "ready to move up". Huberman and Miles (1984, p. 57) indicate that too many or too few "career-driven incentives" hinder implementation. Either situation would likely lessen commitment to implementing the innovation.

Both Huberman and Miles (1984 and Fullan et al. (1988) refer to *commitment* as being important in terms of the priority or centrality of the innovation with respect to other activities. They also refer to negative or positive attitudes toward implementation of the innovation as important. Furthermore, they indicate that an ongoing commitment of administrators to monitoring and providing assistance is needed if implementation is to be most successful. If this does not happen users tend to "downsize" or "blunt" the original concept so that only easy-to-implement parts of the innovation are implemented or implementation stops

part way through with little or no success. No matter how committed people are to an innovation, in some cases changes beyond their control minimize their efforts.

3.5.4 Change

> The outcome of implementation is susceptible to the influence of changes in the general organizational and social context. Frequent or unexpected changes in administration and project leadership, for example, can have a devastating effect on the continuity of a change effort. Career advancement of key personnel is common, both as a result of opportunistic motives and innovation success... Other important features of the local and macro-environment include such phenomena as major shifts in government policies, alterations in implementation of relevant technologies, demographic changes in student populations, economic trends affecting the availability of funding, and public opinion. Finally, one can never anticipate all the "normal crises" that can inevitably occur during the course of implementation (e.g., flu epidemic, snow storm on workshop day, teacher strike). The basic message is that organizational support for implementation has to be flexible and tenacious enough to deal with unexpected turbulence in the local and broader environmental context. (Fullan et al., 1988, p. 3.92-93)

Not only do changes in the environment such as those described above affect implementation but also the receptivity of an environment to change has an effect. Huberman and Miles (1984) indicate that previous experience with and openness to innovation is an important factor in implementation of an innovation. They also indicate that in implementing a major innovation it is often important to maintain a balance between change and stability (p. 280-281). Changes in economic conditions can be one of the most influential factors in implementing an innovation.

3.5.5 Economics

Funding and the way in which funding is handled have a very significant effect on the implementation of most innovations. Huberman and Miles (1984) refer to both external and internal funds as significant variables especially prior to implementation. Havelock and Huberman (1977) refer to "outside vs inside financing" with respect to projects in developing countries (p. 170).

Not only is the availability of funding important but also *how it is controlled*. For example, the control of Foreign Exchange Currency (FEC) in China has a major effect on any project receiving international funding. Havelock and Huberman point out that many items such as the acquisition of ideas and information are not easily quantifiable, and thus are "rarely included in cost estimates" (p. 167). They also intimate that mechanisms need to be in place "to channel the available energies and resources in large-scale innovations in the manner least likely to expend them too quickly or to spread them uneconomically over the life of the project" (p. 74).

3.5.6 Other Contextual Factors

The above list of contextual factors is very general and refers to factors present in most contexts. Many contexts may have unique factors, that affect implementation. For example, language (see Chapter One) is often a significant factor when implementing an innovation cross-culturally.

When considering factors related to context one needs to keep in mind that not only does the context affect the implementation of an innovation but also that the implementation of an innovation in turn affects the context. In many cases the context needs to be modified to accommodate the innovation. Fullan et al. (1988 p. 5,27) refer to this as "organizational capacity-building". The capacity of a context to accommodate an innovation will in some measure determine the amount and type of assistance needed for successful implementation.

3.6 ASSISTANCE

The Researcher defines Assistance as any deliberate action or use of resources that aids the implementation of an innovation. Huberman and Miles (1984) summarize the importance of assistance as follows:

> Large-scale, change bearing innovations lived or died by the amount and quality of assistance that their users received once the change process was under way... The high-assistance sites set up external conferences, in-service training sessions, visits, committee structures, and team meetings. They also furnished a lot of ongoing assistance in the form of materials, peer consultation, access to external consultants, and rapid access to central office personnel. Even close relatives helped out a good deal, often by handholding and talking through difficulties. Although strong assistance did not usually succeed in smoothing the way in early implementation, especially for the more demanding innovations, it paid handsome dividends later on by substantially increasing the levels of commitment and practice mastery. (p. 273)

In order to identify what *type* of assistance was being given, Huberman and Miles (1984 p. 102) developed the following categories of "assistance orientation: Control, Teaching/training, Solution giving, Resource adding, Advocacy, Facilitation, Inquiring, and Support".

Assistance comes from many sources, most of which are related to administrative support at various levels ranging from the national level down to the immediate supervisor and in some cross-cultural implementations support often comes from an international source. These sources of assistance are referred to in the section on influence above. Another source of assistance is users assisting one another. This is discussed in the paragraph on networking below.

Huberman and Miles (1984) indicate that assistance affects "The innovation and its use, Individuals and The organization". One important point is that, in addition to positive effects, assistance or the lack of it can have negative effects especially on individuals. They give two examples: one where assistance was resented because of the pressure being exerted; and the other where the developer was unresponsive to requests for assistance. Below is their list of the content of assistance used to produce positive effects:

On the innovation and its use

1. Planning, developing
2. Goals, direction, priority
3. Aiding start-up
4. Preparing and adding materials
5. Aiding good-quality implementation
6. Program adaptation
7. Program maintenance

On individuals

8. Reducing anxiety

9. Increasing understanding
10. Increasing ownership
11. Feeling supported
12. Enlarging repertoire
13. Solving problems
14. Increasing competence, confidence

On the organization

15. Increasing cohesiveness and trust (Huberman and Miles, 1984, p. 108-109)

The following major factors related to assistance are presented below: Monitoring, Resource Acquisition and Utilization, Training and Skill Development, Networking and Administrative Latitude.

3.6.1 Monitoring

Both Huberman and Miles (1984) and Fullan et al. (1988) indicate that monitoring the progress of implementation, solving problems and providing appropriate assistance are keys to successfully implementing an innovation. Havelock and Huberman (1977) make the following statement:

> The usefulness of monitoring the results of an innovation is not only to inform others. It is also useful to inform oneself in order that (a) more information be available to improve the project in its next phase, (b) the innovation can be compared to other possible options and (c) that decisions can be made on the extension or generalization of the innovation to other settings.
> (p. 266-267)

Monitoring can also be used to test the validity or legitimacy of the innovation. Moritoring should result in problem solving and providing moral and other support as needed.

3.6.2 Resource Acquisition and Utilization

Havelock and Huberman indicate that the "use of sophisticated resources" is related to efforts expended in acquiring the following:

1. Books and documents on education for development
2. Documents on similar innovations in other countries
3. Site visits to similar projects in other countries
4. Site visits to similar projects within the country
5. Experts from outside the country (p. 189)

They also indicate that the "use of sophisticated resources" is most strongly related to the following variables:

1. Use of quantitative written reports for evaluation
2. Over-all effort to evaluate the project
3. Systematic collection of (evaluative) data
4. Need for project expressed via television
5. Project had a distinct 'planning' phase
6. Use of all types of media...
7. National financial contribution
8. Social interaction strategy. (p. 189)

The "use of sophisticated resources" is negatively correlated to "defining objectives with outside help". Figure 3.4 represents a model for user dialog with potentially useful resources or sources of assistance. This figure can be used as a checklist for resource utilization.

Figure 3.4 User-resource dialog: A checklist for resource utilization. (From *Solving Educational Problems: The Theory and Reality of Innovation in Developing Countries* by R. G. Havelock and A. M. Huberman, 1977, p. 191.)

3.6.3 Training and Skill Development

Huberman and Miles (1984 p. 81, 273) indicate that although training and skill development with respect to using an innovation is important, a more important factor is the existence of skills and experience necessary to implement the innovation. The development of pre-requisite skills and experience is of primary importance in cross-cultural implementation. Fullan et al. (1988) indicate that in addition to providing specific

training sessions with demonstrations, time should be given to use the innovation and plan for its implementation. They also state that provisions need to be made "for ongoing socialization and training of *new staff members* with the use of the innovation" (p. 3.57). Ongoing training is also needed as new features of the innovation are introduced. Sometimes this type of training can be best distributed through a network of users and those assisting in the implementation.

3.6.4 Networking

Fullan et al. (1988) make the following statements with respect to networking as it relates to their study:

> Once something like an Ontario Diffusion Network is operating, we can anticipate active local engagement with it. Schools and boards would send teachers and administrators to regional awareness conferences, select key practices they regarded as promising, and implement them... Less-formalized networks should also be created. This strategic stream is important because research shows clearly that user interaction and mutual support is key for effective implementation and wider diffusion. (p. 5.24)

Assistance needs to be given in developing both formal and informal networks for implementation to be most successful.

3.6.5 Administrative Latitude

"Administrative latitude [is the] willingness to allow users to make changes in the innovation, rather than maintaining a prescriptive stance... the 'latitude' given was essentially freedom for the users to build and manage a demanding setup... not latitude to adapt the program out of existence" (Huberman and Miles, 1984, p. 111-112). Assistance is needed so that users can adapt an innovation to a local context or to make

improvements to it as well as to avoid adapting away important features that would produce more significant outcomes. One of the keys to making this happen is good planning.

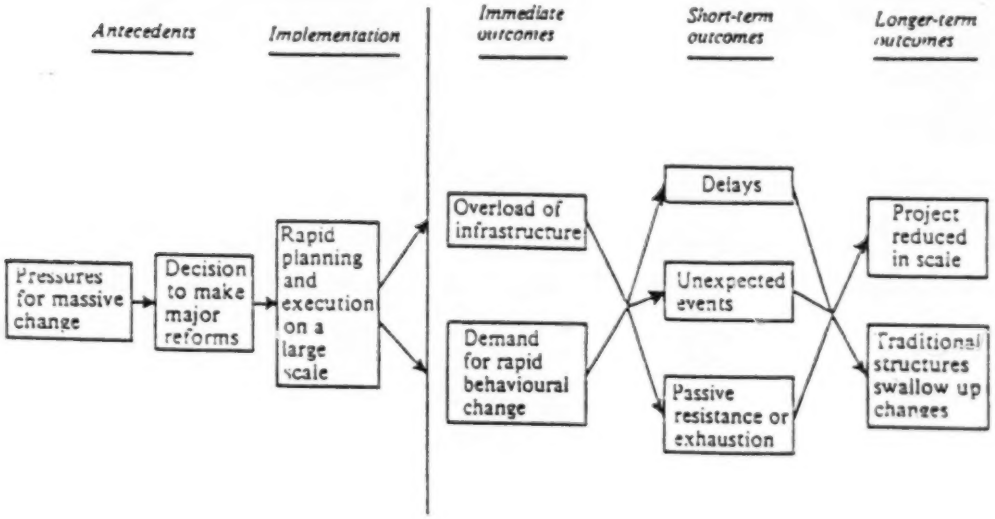
3.7 PLANNING

As indicated in Figure 3.1, Planning is a process, that parallels The Innovation Process: in The Initiation Stage, plans are made for the adoption and implementation of an innovation, and in The Implementation Stage, these plans are continually revised until implementation is complete. Planning involves all of the other factors discussed above and is often the key factor in implementation. Planning should involve examining the innovation and the context into which it will be implemented, provide for adequate assistance, consider institutionalization as part of the implementation process, and anticipate the outcomes of implementation but allow for flexibility so that unexpected outcomes can emerge and be dealt with.

Fullan et al. (1988, p. 59) state: "Good implementation requires good planning. Plans do not have to be in the form of elaborate documents, but they do need to focus on the right factors and have the approval of people in positions of authority to see that they are carried out". Good planning also includes input and support from potential users of the innovation.

Havelock and Huberman (1977) use figure 3.2 to discuss planning mechanisms found in their study. Note the broken lines, which represent shortcuts in the problem-solving cycle. Havelock and Huberman indicate that, if

Figure 3.5 Problems resulting from inadequate planning. (From *Solving Educational Problems: The Theory and Reality of Innovation in Developing Countries* by R. G. Havelock and A. M. Huberman, 1977, pp. 73.)



detailed planning has taken place, generally "no or few short-cuts [have been made] in the cycle [and a] low or moderate number of unexpected or problematic outcomes [were encountered] during implementation" (p. 140). Their diagram of "A 'problematic' pattern of implementing and outcomes of innovative projects" illustrates problems resulting from inadequate planning (see figure 3.5). Havelock and Huberman identify the following categories of problems that "could have been avoided or lessened by more comprehensive planning":

1. problems due to weaknesses in the infrastructure or procedural configuration, many of which could have been anticipated, lessened or even avoided by more careful, realistic planning;

2. problems due to dependence on external systems, notably technical assistance agencies, some of which could have been resolved through more careful planning;

3. problems due to either situational factors, in particular cultural and psychological variables, of which many could have been anticipated and reduced by a more 'adaptive' or more 'responsive' cycle. (p. 145)

They present the following list of components found in a typical comprehensive plan:

1. definition of need
2. specification of objectives
3. analysis of expected outcomes
4. analysis of expected benefits
5. analysis of expected financial costs
6. analysis of expected costs in non-financial terms
7. estimate of manpower requirements
8. estimate of material requirements
9. specification of organizational structure of the project
10. a chart of organizational structure of the project
11. specification of steps involved in the project and connexion [sic] between steps
12. time, cost and manpower requirements for each step
13. specification of evaluation procedures
14. specification of diffusion-dissemination procedure of strategy (p. 138-139)

Wilson (1977, p. 21) includes "Plan... Approval" as a component of a comprehensive plan.

Havelock and Huberman (1977) point out that planners have the following four options when they realize "the procedures for planning and carrying out a project may be unreliable or insufficient to achieve the project's goals" (the fifth option has been added by the author):

1. Reduce the size and ambition of the project.

2. Go ahead and implement the project, relying heavily on the energy and committment [sic] of the educational and political leaders involved.

3. [Get] massive outside aid (loans, grants, expertise, materials and equipment).

4. Take resources and trained people from one sector and place them in a project of higher priority.

5. Implement the project in stages, which is related to but different from option number one.

Fullan et al.'s discussion of good planning assumes that the decision to adopt an innovation has already been made. In most cases planning needs to start prior to this decision being made in order to minimize "conflict" and maximize "consensus". "The prospects for successful implementation are greater when those expected to carry out a change agree on the need, on the appropriateness of the innovations selected, and on the priority of the change effort relative to other local concerns" (Fullan et al., 1988, p. 3.20-21). Carefully researching the "need" for and "appropriateness" of an innovation will assist in planning for its implementation. Sun's (1985) article reflects this type of planning (see Chapter Two). First a decision was made to automate, then a general investigation was conducted and finally particular systems (innovations) to implement were selected. The factors mentioned in the preceding sections could be used to evaluate the need for and the appropriateness of innovative ideas like searching North American databases and specific innovations like Dialog OnDisc ERIC, in order to make effective adoption decisions and to develop plans for implementation.

Planning is an ongoing process of developing and modifying Policies, Strategies and Operational Plans.

3.7.1 Policies

Policies are general goals related to the implementation of an innovation. Some of these are context and innovation specific. The way in which policies are stated and enforced in a specific context should be considered. For example, in China policies are often not formally stated and change without notification (although this is the general case, formal policies are being established especially in matters related to foreigners). The interpretation and enforcement of policies are most frequently left to local authorities (Turner-Gottschang, and Reed, 1987, p. 71-72). Strategies need to take into account how policies are viewed in a specific context.

3.7.2 Strategies

Fullan et al. (1988) make the following statements about strategies and how they relate to "*planning assumptions*":

> Many strategies assume a rational, programmatic, technocratic planning model, with specifically-designed steps, well built by a central body after extensive cost-benefit analyses and tight specification of aims. It is very clear that such strategies will not work [in the situation related to their study]... Thus it seems clear that a process planning or adaptive approach will be required, in which a variety of strategic initiatives can be launched; there should be a strong emphasis on learning from practical experience, and the approaches taken should be steadily influenced by concrete experience with them... Learning from practical experience... should be strategically stimulated to maximize the linkage between good practices as they evolve, with dissemination, professional development and technology development. (p. 5.5-6)

They also indicate the inappropriateness of the following strategic types to their study:

1. Mandating: specifying required changes in legal or regulatory terms, and following this with inspection and enforcement. Mandating... can hardly work well when end states are not known.

2. The strict research, development, and diffusion (RDD) model.

3. Local materials development (asking local boards and schools to develop teaching materials in a decentralized fashion, to enlarge local commitment and local relevance) is not wholly workable either... The strategy of local development can certainly be used in the generation of materials supporting useful classroom management and instructional strategies. (p. 112)

With respect to the Researcher's study a combination of different strategic planning types will be needed at different stages in the planning process. Initially the "process planning" approach would be most useful. It would need to be used in conjunction with an RDD model, so that inappropriate technology and practice are not implemented on a mass scale. Some "local materials development" will also be necessary. During the development and diffusion stages of the RDD model "mandating" would probably be appropriate for the Chinese context.

Based on their analysis of implementation factors and the context in which their study took place, Fullan et al. (1988) developed "criteria for a good strategy". These criteria could be modified to fit other contexts as a guide for developing good strategies (see Appendix A4). Havelock and Huberman (1977, p. 69) investigated six types of strategies and present an "optimal strategy for system changing and innovation" (see Appendix A4).

3.7.3 Operational Plans

Strategies need to be transformed into operational plans; figure 3.6 could be used as a guide for this process. Each innovation and each context

Figure 3.6 Questions comparing strategies and operational plans. (After Haymeyer, U. and Loucks-Horsley, S., as presented in "Strategies for Implementining Microcomputers in Schools: The Ontario Case" by Michael G. Fullan, Matthew B. Miles and Stephen E. Anderson, 1988, pp. 5.3)

	Strategy	Operational Plan
WHAT?	What is the aim of the improvements?	What will be done to carry out this aim?
WHO?	Which organizations and roles will be involved?	Who will be involved in each of the activities?
HOW?	What is the general nature of the activities?	What specific activities will be used?
WHEN?	What is the time frame for the improvement effort?	In what phase of the change process will each activity occur? When will each take place?
WITH WHAT RESOURCES?	What kinds of support will be needed?	What funding, personnel, facilities, materials, time will be needed for each activity?

require specific operational plans. Thus further discussion of operational plans is beyond the scope of This Chapter.

Planning using The Researcher's Model should involve examining needs and innovations, in context, using factors identified by the model. Secondly, planning should provide for adequate assistance. Thirdly, planning should consider institutionalization as part of the implementation process. Lastly, planning should anticipate the outcomes of implementation but allow for flexibility so that unexpected outcomes can emerge and be dealt with.

3.8 SUMMARY

Implementing an innovation is a complex process involving, The Innovation, The Context, Assistance and Planning. The Researcher's Model described above is designed to clarify and simplify some of the concepts related to this process. Planning, especially the development of good strategies, is seen as the key to successful implementation. All of the other factors presented in the model are considered when developing a comprehensive plan.

The Researcher's Model presented in this Chapter was developed by combining concepts from four very different studies to produce a model that is a generalization of the concepts presented in the individual studies. References to important sections of these studies are made below. Fullan's model is best summarized in his discussion on "good planning" (p. 51). Huberman and Miles' (1984) study is summarized in their final chapter on "What Have We Learned?". The results of Havelock and Huberman's (1977) study are summarized in their first chapter. Chapter Two of their study presents an excellent overview of "Social systems and innovation systems".

In Chapter Five The Researcher's Model is used as a guide for analyzing data from The Independent Research Project. In Chapter Six, the model is used to develop a pilot study plan and in Chapter Seven, as a basis for The Cooperative Information Systems Model. The Researcher's Model is described above in general conceptual terms. In Chapters Five and Six, it is applied to a specific innovation, CCERIC (Chinese Computerized Educational Resources Information Centers), to be implemented in a specific context, Chinese Academic Institutions. In Chapter seven the

specific context, Chinese Academic Institutions. In Chapter seven the model is used to develop, a general model for Implementing Cooperative Information Systems in Chinese Academic Institutions.

Chapter Four

Methodology

4.1 OVERVIEW

In chapter two the overall Chinese context was introduced. In this chapter the specific context related to this Study is presented. This chapter begins with an overview of naturalist approaches to educational research. Next data gathering and data analysis techniques are discussed; the research design is presented and the case study described. This is followed by specific information related to specific sites and activities. The methodology described in this Chapter has influenced the development of the CCERIC concept and The Cooperative Information Systems Model discussed in Chapter Seven. Observations on using this methodology are also presented in Chapter Seven.

4.2 NATURALISTIC APPROACHES TO EDUCATIONAL RESEARCH

The basic research method used in this Study is a naturalistic approach, involving a case study and interviews. Worthen and Sanders (1987) in describing "Naturalistic and Participant-Oriented Evaluation Approaches" identify two threads that seem to run through these approaches. They quote Wachtman (1978, p. 2) to describe the first thread: "Each author argues that instead of simplifying the issues of our humanity we should, in fact, attempt to understand ourselves and education in the context of its complexity". The second thread is that in "most of these writings, value pluralism is recognized, accommodated and protected". (p. 129)

Worthen and Sanders also list the following characteristics of these approaches:

> 1. They depend on inductive reasoning. Understanding an issue or event or process comes from grass-roots observation and discovery. Understanding emerges; it is not the end product of some preordained inquiry plan projected before the evaluation is conducted.
>
> 2. They use a multiplicity of data. Understanding comes from the assimilation of data from a number of sources. Subjective and objective, qualitative and quantitative representations of the phenomena being evaluated are used.
>
> 3. They do not follow a standard plan. The evaluation process evolves as participants gain experience in the activity. Often the important outcome of the evaluation is a rich understanding of one specific entity with all of its idiosyncratic contextual influences, process variations, and life histories. It is important in and of itself for what it tells about the phenomena that occurred.
>
> 4. They record multiple rather than single realities. People see things and interpret them in different ways. No one knows everything that happens in a school. And no one perspective is accepted as the truth. Because only an individual can know what he or she has experienced, all perspectives are accepted as correct, and a central task of the evaluator is to capture these realities and portray them without sacrificing education's complexity. (p. 129, 130)

The Researcher reviewed the approaches presented by Worthen and Sanders, with particular attention to Lincoln and Guba's (1985) presentation on "Naturalistic Inquiry". From the review it was realized that some aspects of "Democratic Evaluation" have been used. MacDonald (1976) describes "Democratic Evaluation" as follows:

> Democratic evaluation is an information service to the community about the characteristics of an educational programme... [It] recognizes value pluralism and seeks to represent a range of interests in its issue formulation. The basic value is an informed citizenry, and the evaluator acts as broker in exchanges of information between [differing] groups... His techniques of data gathering and presentation must be accessible to non-specialist audiences... [The

> evaluator] engages in periodic negotiation of his relationships with sponsors and programme participants... The key concepts of democratic evaluation are "confidentiality", "negotiation" and "accessibility". (p. 185)

This Study is democratic in that researcher has acted as an "broker" to provide an "information service to the community". MacDonald also refers to "autocratic" and "bureaucratic" evaluation. This Study is "autocratic" since the Researcher is using the results of the research for this thesis and other publications. In other instances it is "bureaucratic", which has been necessitated by the bureaucratic structure of Chinese society.

One of the reasons specific Naturalistic and Participant-Oriented Evaluation Approaches have not been adopted is that they are designed for evaluation studies and not applied research studies. Worthen and Sanders (1987) differentiate between the two as follows:

> Applied research (as opposed to basic research) is aimed at producing generalizable knowledge relevant to providing a solution to a general problem. Evaluation focuses on collecting specific information relevant to a particular problem, program, or product. (p. 27)

As a result of this difference, research methodologies for this Study were adapted from Educational Ethnography, Social Science, and Information Science, as well as from Educational Evaluation literature. For example, the Researcher has done a comprehensive contextual analysis similar to that suggested by Baark (1985). Other influences are described in the following sections.

4.2.1 Case Studies

> Descriptive research in the form of case studies is usually the jumping-off point for the study of new areas in the social sciences... The Researcher's sole resources are whatever concepts he can borrow from other fields and the ordinary words of the common language... He must create his own classification and his own guideposts. He must decide what to look at and what to ignore, what to record and what not to record, which clues to follow up and which to drop, what is important and what is valueless. (Simon, 1978, p. 44-46)

Because of the unknowns and cross-cultural nature of this Study the case study has been chosen as the major research method for this Study. Another reason for choosing the case study is that it makes "naturalistic generalization possible" (Johnson, 1987, p. 53). Knowledge gained by naturalistic generalization is

> arrived at by recognizing the similarities of objects and issues in and out of context and by sensing the natural covariations of happenings. To generalize this way is to be both intuitive and empirical... Naturalistic generalizations develop within a person as a product of experience. They derive from the tacit knowledge of how things are, why they are, how people feel about them, and how these things are likely to be later or in other places with which this person is familiar. They seldom take the form of predictions but lead regularly to expectation. They guide action, in fact they are inseparable from action. (Stake, 1978, p. 6)

MacDonald and Walker (1977) indicate a need for educational research to capture the experience of practitioners for the benefit of others. They advocate that one way of doing this is to use case studies.

4.2.2 Data Collection and Analysis Techniques

In conjunction with the naturalistic approach described above, educational ethnography methodologies were used. Data collection and data processing techniques generally relate to educational ethnography. Goetz and LeCompte (1984) state:

> The purpose of educational ethnography is to provide rich, descriptive data about the contexts, activities, and beliefs of participants in educational settings. Typically, such data represent educational processes as they occur. The results of these processes are examined within the whole phenomenon; isolation of outcomes is rarely considered. Educational, ethnography has been used for evaluation, for descriptive research, and for theoretical inquiry. Studies that purport to be educational ethnographies vary widely in focus, scope, and methods of execution. (p. 17)

In reference to data collection and analysis they make the following comments about triangulation.

> Ethnographers use many types of data collection techniques, so that data collected in one way can be used to cross-check the accuracy of data gathered in another way. Just as a surveyor locates points on a map by triangulating on several sights, so an ethnographer pinpoints the accuracy of conclusions drawn by triangulating with several sources of data. (p. 11)

4.2.2.1 *Participant Observation*

> Participant observation is the primary technique used by ethnographers to gain access to data. In this mode the investigator lives as much as possible with and in the same manner as the individuals being investigated. (Goetz and LeCompte, 1984, p. 109)

The Independent Research Project introduced below offered an excellent context for participant observation. Both the Researcher and members of the research team acted as participant observers. Participant observations of the Researcher and the foreign research assistant are identified to distinguish them from observations made by Chinese colleagues.

4.2.2.2 *Interview Techniques*

Denzin (1978) differentiates between standardized and nonstandardized interviews. With respect to nonstandardized interview he states: "In it, no prespecified set of questions is employed, nor are questions asked in a specified order... This gives the interviewer a great deal of freedom to probe various areas and to raise and test specific hypotheses during the course of the interview" (p. 116). Nonstandardized interviews were found to be most effective for use in the Researcher's study. Variations of the following types of interviews were used in the study: Key-Informant Interviews, Career Histories, and Surveys.

With respect to key-informant interviewing Goetz and LeCompte (1984) state:

> Key informants are individuals who possess special knowledge, status, or communicative skills and who are willing to share that knowledge and skill with The Researcher (Zelditch 1962). They frequently are chosen because they have access--in time, space, or perspective--to observations denied the ethnographer. (p. 119)

Some of the key-informants were "experts" in their field. Simon (1978) defines "expert opinion" as "the judgements and estimates made by people who have spent much of their time working with a particular subject and who have gathered much general information that has been filtered through their minds and stored in their memories" (p. 208). Expert opinion can be used to obtain objective information but more crucially to obtain "judgements that require examination of an entire context" (p. 209). Other key-informants were chosen because they had a good understanding of the research project and the context in which it was conducted. Interviews with experts were usually somewhat formal, with one or more

people accompanying the expert and a tour of the facilities and/or a demonstration of a computer system conducted. The Researcher usually sent a list of questions to the interviewees so they could prepare for the interview. These questions evolved over time to produce the set of questions found in Appendix B1.

With respect to Career histories, Goetz and LeCompte (1984) state: "Career histories, or narrative accounts of individuals' professional lives, may be useful devices for determining how participants respond to settings, events, or particular innovations" (p. 120). Although complete career histories were not obtained for this Study, career histories related to specific situations were obtained. One type of career history, which is referred to as an "Introduce Yourself Survey" was found very useful in getting information from a group of 5 to 20 participants.

Open ended qualitative surveys used in conjunction with interviews were found to be very useful. Since participants were unfamiliar with surveys designed to produce enumerative data, these were generally unsuccessful. Attempts were made to use multiple choice, ranking and rating type surveys. There may have been some misunderstanding with respect to survey items and protocols. In this regard, Goetz and LeCompte (1984) state:

> Interviewers and respondents should share common assumptions about what protocols and instrument items mean and how they are structured... Although discussing protocol design with respondents may be unfeasible, interviewers should use questions that make sense to respondents and that elicit the data required. (p. 121)

4.2.2.3 *Data Analysis Techniques*

Goetz and LeCompte (1984) make the following comments with respect to data analysis: "Analytic processes used in ethnography differ from those used in many other research designs... Rather than relegating analysis to a period following data collection, ethnographers analyze data throughout the study" (p. 165). Data analysis techniques described by them, that have relevance to this Study are: Theoretical Sampling, Analytic Induction, Typological Analysis, and Integration and Interpretation.

"Theoretical sampling involves a careful search for the theory that best matches the existing data" (Goetz and LeCompte, 1984, p. 176). Theoretical sampling was conducted prior to, during and after data collection. Two methods of theory sampling were used: discussions with experts and reviewing the literature. Theoretical sampling prior to data collection produced a general theoretical framework for the study (Ibsen, 1987b). Sampling during data collection gave direction to further data collection and post-sampling provided background information for chapters two and three. It is highly unlikely that earlier theoretical sampling would have been as significant as post-sampling.

With respect to Analytic Induction, Goetz and LeCompte (1984) state:

> Ethnographers usually begin with a form of analytic induction. This strategy involves scanning the data for categories of phenomena and for relationships among such categories, developing working typologies and hypotheses upon an examination of initial cases, then modifying and refining them on the basis of subsequent cases. (p. 179-180)

Although inductive analysis was conducted throughout the study, the following major analyses were conducted after data collection. The first was a review of the data to create a general descriptive outline. The

second was based on theoretical sampling reflected in chapters one and two and used in conjunction with typological analysis to produce the model presented in chapter three. A third inductive analysis was conducted to produce the typologies used in chapters four, five, and six.

> Typological analysis involves dividing everything observed into groups or categories on the basis of some canon for disaggregating a whole phenomenon. Such typologies may be devised from a theoretical framework or set of propositions or from common sense or mundane perceptions of reality. (Goetz and LeCompte, 1984, p. 183)

4.2.3 Research Design

Three major features of the research design were: to use an independent research project as a means of gathering data, to involve personnel from the host institution on the research team and to obtain participation from as wide a sector of Chinese society as possible. These features are discussed below in relationship to The Independent Research Project.

4.3 THE INDEPENDENT RESEARCH PROJECT

In order to have as naturalistic a setting as possible in which to gather data for this Study the Researcher arranged with the host institution to conduct a joint research project. The host institution was aware of the Researcher's intent of using the data for his thesis. Although the project was separate from the thesis, it is closely related. The proposal and research plan (Ibsen, 1987a, 1987b) for the thesis gave initial guidance for the project. Members of the research team had access to these documents. The plan was refined and further developed through interaction with the research team, participants and the context of the project.

Midway through the research project a partial report of the research was written (Ibsen, 1987). The following research questions were addressed in this report:

1. What is currently being done by China's educational institutions to process information?

2. What are the objective needs of China's educational institutions for information processing systems?

3. How can modern information processing technologies be used to meet the needs of China's educational institutions?

Although not explicitly stated, the following research question became a specific focus of the project:

> Based on current practices and technology (CDROM and microcomputer), what kind of system needs to be developed to effectively process information indexed in the ERIC database?

The Independent Research Project is discussed below using the following Headings:

1. The Research Team
2. An Introduction to Sites Visited
3. Seminars
4. Lectures
5. Interviews

4.3.1 The Research Team

Members of the research team consisting of personnel from the host institution and two Canadians are designated as follows:

1. *The Supervisor*, who was the head of the host institution, gave general oversight to the project by meeting periodically with the research team both individually and corporately.

2. *The Advisor*, who was head of the host research group, gave advice on the day to day operations of the project, especially as it related to his research group.

3. *The Researcher*, who is also the author of this thesis, was the principal investigator for the research project.

4. *The Coordinator*, who was a teaching assistant in the host institution, coordinated the activities of various groups and made arrangements for research related activities.

5. *The Secretary*, who was a young teacher in the host institution, took care of the administrative matters such as making arrangements for travel and the purchase of equipment.

6. *The Research Assistant*, who was a Canadian accompanying the Researcher, assisted in data collection and other research activities.

7. *The Librarian*, who was the head librarian of the host institution, obtained information related to the research and assisted in other research activities.

8. Sometimes the terms "*research assistant(s)*" and "*advisors*" are used to refer to members of the research team mentioned above as well as to others who were involved on the research team for part of the research period. (About two months after the research commenced another research project received funding and an advisor and research assistant, not specifically mentioned above, were assigned to that project.)

Note: A list of major participants is found in Appendix C1.

4.3.2 An Introduction to Sites Visited

Two major Sites (A and B) were selected as being most important for the research conducted in conjunction with this Study. At Site A an extensive case study was conducted and the Researcher stayed at Site B for two periods of about one week each. These sites are considered to be two of the most important institutions (Normal Universities) involved in educational science in China. Interviews were conducted at Sites C, D, E, and G, and a lecture series was given at Site F.

4.3.2.1 *The Case Study Site (A)*

The case study took place at a key Normal (teacher training) University situated in one of China's major cities. Although the Researcher had contact with several departments and work groups within the university, his main contact was with the Computer Assisted Instruction research group that was part of the educational technology research institute at the university. The primary purposes of the case study was to get a close-up view of the context, especially how different work groups cooperate with each other. Almost all of the Researcher's five-month stay was spent at site A.

The Researcher first made contact with Site A through the professor, who eventually became the Supervisor of The Independent Research Project. Since he had visited Toronto, contact was made through people who were acquainted with him. A letter of introduction and an initial proposal for a joint research project were sent to him and through correspondence an initial agreement was made and documents for visa purposes processed.

4.3.2.2 ***The Alternate Site (B)***

Although Site B is also one of the key Normal Universities, it was selected as an alternative site for two reasons. First, the Researcher had no personal connections with this institution prior to going to China. Second, the Researcher was unaware of a department that wanted to cooperate in conducting the research. During the Researcher's visits to Site B he was also involved in activities at other sites.

Contact with Site B was made through the Researcher's host institution. Arrangements were made through contacts of his supervisor and a faculty member from the host institution who visited Site B. (As a result of having two people making arrangements, the Researcher was double booked with respect to housing.)

4.3.2.3 *Interview Sites C, D, E*

Visits to Sites C, D, and E focused around the "2nd Beijing International Symposium on Computerized Information Retrieval". Two approaches were used to obtain interviews at these sites. The first was to send letters to the authors (experts C, D1, E, see Appendix C1) of papers presented at the first symposium, mentioning the Researcher's Canadian professor, who had also presented a paper at that symposium. In the letters the Researcher requested an interview to discuss his research (a list of questions related to the research, similar to the ones found in Appendix B1, was included with the letters). Accompanying each letter was a letter of introduction from the Researcher's Chinese supervisor. The second approach was for expert A (from the Library and Information Science Department at Site A, (see seminar section below) to send letters of introduction to experts C, D2, and E (see Appendix C1). Her letters also asked if it was possible for the Researcher to present a paper at the second symposium. Experts C and E responded by letter, and the interviews were confirmed by telephone. The third interview was arranged by telephone. As a result of the above mentioned letters and interviews discussed below the author was invited to present a paper at the second symposium.

4.3.2.4 *Lecture Site F*

The host institution for this lecture series was an adult vocational teacher training college (primarily for factory trainers). The head of the host department (Expert F) for the lecture series attended one of the lectures given by the Researcher in conjunction with the Computer Based Education Group. He was a friend of the Researcher's supervisor and arrangements were made through the Supervisor to give two lectures.

4.3.2.5 *Interview Site G*

At Site G, which is a major Chinese library, two groups were visited: at the Library Automation Department an interview took place and a demonstration and experimentation session took place in the Abstracts and Index Reading Room. Site G was a very modern facility with the latest technology, including a Dialog OnDisc ERIC CDROM system.

Contact with the head of the Automation Department (Expert G1) was made as a result of the interview at Site C. This contact was followed up by telephone calls and letters to arrange for the visit. At the interview the Researcher was introduced to a staff member (expert G2), who had installed the Dialog on Disc ERIC system, who in turn introduced the Researcher to the computer searcher (Information Specialist G) in the Abstracts and Index Reading Room.

4.3.2.6 *Chronological Order of Site Visits*

Since site visits and activities are not always presented in chronological order, the following chronological list of major activities is presented for the reader's reference:

1. The establishment of the administration and coordination seminar groups at site A.
2. The first lecture and visit to Site B.
3. Interviews at Sites C, D, and E.
4. The lecture series at Site A.
5. The second lecture and visit to Site B.
6. Symposium at Site D.
7. Visit to Site G.
8. Search analyses and faculty and student seminars at Site A.
9. Lectures at Site F.
10. Lecture to the biology group at Site A.

4.3.3 Seminars

One of the best ways of exchanging information in Chinese academic institutions is through the use of seminars. Seminars used in The Independent Research Project were a cross between lectures and meetings, both of which are familiar to the Chinese academic community (Note, seminars were only used at Site A). The following types of seminars are introduced below:

1. Research Team Seminars
2. Faculty and Student Seminars
3. Search Analyses Seminars

4.3.3.1 *Research Team Seminars*

The research team (see introduction above) was organized into two seminar groups: The Administration Group and The Coordination Group. In the initial stages of The Independent Research Project (see description above), the administration group was prominent and in latter stages the coordination group was prominent. Procedures for both groups were similar, with the Researcher guiding the sessions following a printed agenda. The Researcher and research assistants would report progress on various items on the agenda, a discussion would follow and plans would be made. At most of the seminars the Research Assistant (Canadian) typed the contents of the seminar into a portable computer. This procedure was also followed for most of the lectures and seminars mentioned below. Both The Administration and Coordination Seminars were tape recorded as backup.

One purpose of The Administration Seminars was to teach the Chinese research assistants principles related to the administration of a research project. Other purposes and activities of the administration group are discussed in Appendix C2 using the following headings: "Negotiations" and "Making Arrangements".

As result of initial administration sessions, it became apparent that administrative functions needed to be separated from research functions. In order to do this The Coordination Group was formed and one of the Chinese research assistant appointed as project coordinator. The Coordinator attended as many activities related to the research project as possible.

One of the activities of The Coordination Group was to facilitate cooperation with other groups. This was often done by the Coordinator making contacts with other groups and following these contacts up to make research arrangements. Although this took considerable time and effort especially in building relationships, in many cases, the desired research goal (i.e. an interview) was eventually achieved. Cooperation with the Library and Information Science Department at Site A is summarized in the following paragraphs. Other activities of the coordination group, such as discussing research methodologies and plans, are found in Appendix C3.

4.3.3.2 *Cooperation With the Library and Information Science Department*

Similar to most of the other library groups at Site A (see Appendix C5), a request for this department to participate in the research was made soon after the Researcher arrived. Arrangements for a meeting were made by The Secretary (see research team mentioned above). The meeting was attended by Expert A (head of the group and a respected information scientist) and the two other members of the computer group from the Library and Information Science Department as well as the Researcher and three Chinese research assistants.

The meeting was conducted in English with periodic translation into Chinese. Participants from the Library and Information Science department described their function and some of the activities they were involved in. In addition to providing instruction, one of their major functions was to design information retrieval software. They were quite familiar with software used to retrieve information from magnetic tapes originating in North America. They were not very familiar with CDROM technology and its

potential use. They wanted to experiment with it before getting too involved. Also they wanted to see the cost effectiveness of CDROM demonstrated.

In addition to attending lectures, seminars and meetings; several informal cooperative arrangements were made. Many of these were in conjunction with the above mentioned symposium. Others related to the ordering a demonstration ERIC CDROM system for educational use. The cooperative efforts were cut short by an extended illness of the director of the department and time constraints of personnel from the Library and Information Science Department.

4.3.3.3 *Faculty and Student Seminars*

With respect to end-user information retrieval, The Faculty Seminar Group was the best source of information, of any group participating in The Independent Research Project. Two participants were end users and two were information specialists. Two of the participants had experience in computerized information retrieval; one as an end user and the other as an information specialist. Information specialist A (see appendix C1) also taught courses on information retrieval and used printouts of computer searches to introduce computerized retrieval. The Librarian (see Research Team above) had extensive experience in manually retrieving and disseminating information to faculty. All of the participants had a good understanding of English and could participate in a discussion. Since the information specialists were not as good in verbal communication as the end users, clarification would sometimes take place in Chinese. (A summary of the content of faculty seminars is found in Appendix C3.)

Since the Coordinator was in charge of the English club, he invited the Researcher to hold seminars at two of the club's meetings. The purpose of the seminars was to determine student interest in computer searching and to find out if the analysis of computer searches could be incorporated into the undergraduate program. An "Introduce Yourself Survey" (see lecture section below) was used to get an understanding of the students' experience and to develop relationships. Students were asked to give their name and their experience with using English language information in their courses. This led to a discussion of how English language information and the use of computer searches could be introduced into the curriculum. Initially students were reluctant to participate but began to talk freely after being encouraged by the Coordinator.

4.3.3.4 ***Search Analyses***

Two ERIC searches were analyzed to determine the usefulness of ERIC and potential methods for analyzing computer searches. The Researcher and the Coordinator invited faculty and students to participate in analyses conducted using a computer. The Coordinator invited undergraduate students from the English and Computer clubs of the host department to participate in the hard (printed) copy analyses.

For the first search, ERIC records, which had been downloaded from the CDROM to a floppy disk, were analyzed on a computer screen was using two different word-processing packages. Using the "PC Write" word-processing program, some records were stored in files to be printed for participants who wanted a copy, others were deleted because they were either irrelevant

to the search topic or to the Chinese context. A similar type of analysis was done using the "Wordstar" word processing program except that instead of creating new files for printing, records that were not to be printed were deleted and records for which more than one participant wanted a copy were repeated. The result was a file that was longer than the original file since several people wanted copies.

The second search was analyzed by students using hard copies of ERIC records and analysis forms. This type of analysis was done in two groups, one from the English Club and one from the Computer Club. The first was conducted by the Researcher and the Coordinator and the second by the Coordinator after the Researcher had left China. Individual student analyses were synthesized for both analyses. For the first analysis, two members of the faculty group and the Researcher identified records, for which it was desirable to obtain primary documents. Since none of these documents was found in China, the Researcher sent one document in printed format and the other in Microfiche format as samples after he left China. A report of the analysis conducted by the Coordinator and a sample form are found in Appendix E1.

4.3.4 Lectures

In many ways initial lectures were more of a learning experience for the Researcher than for the participants. The following points summarize lessons learned by the Researcher:

1. The lecture is the primary means of instruction in China.
2. Most of the time devoted to the lecture should be spent in delivering the lecture.

3. Content, especially technical content, is the most important part of the lecture.

4. One of the best means of making contact with a group of people is to offer to give a lecture.

5. For most participants one or perhaps two lectures on information systems would have been sufficient.

An overview of the use of surveys, lecture content and specific lectures is presented in the following sections (more detail is presented in Appendix C4).

4.3.4.1 *Surveys*

Another learning experience related to lectures was the discovery of what is acceptable and useful in terms of gathering data through questionnaires and surveys. Experiences (mostly negative) with questionnaires are discussed in Appendix C4 and use of the "Introduce Yourself Survey" is presented below.

One of the survey techniques which worked well with smaller groups was the Introduce Yourself Survey. For example, in one group, participants were asked to introduce themselves in English if they could speak English. Most introduced themselves in English and some in Chinese through an interpreter. They were asked to give their name, their use of English language information and how they got the information. The Researcher usually interacted with each participant. This technique was used at three lectures and two seminars.

4.3.4.2 *Lecture Content*

Core content of most lectures consisted of variations of the content described in this section (additional content for specific lectures is presented in Appendix C4). The Researcher used two guiding principles of IDRC (see Appendix A1) to introduce the concepts that Chinese academics need to have ways of accessing North American information and the need for cooperation if access is to be economical. The Researcher then introduced computer searching and ERIC using a series of overheads, some of which are found in Appendix C4. The online system transparency was used to illustrate the various ways a computer is used to access a database, starting with the printing of paper indexes and concluding with searching using a CDROM system. The economics of mass use of CDROM searching was explored. How Optical Disk (CDROM) technology works was also briefly introduced. An example of a computer search was given and a Venn diagram used to explain the advantages of using computer searching. Online searching was then compared to CDROM searching.

4.3.4.3 ***Lectures at Site A***

A lecture series consisting of four lectures was given at Site A. The series was sponsored by the Researcher's host department and was open to the whole campus. Invitations were sent to faculty from the host department asking them to reply (see Appendix B2). Students were invited by the Coordinator and other participants, especially from the Library and Information Science Department. Others were invited through an attractive poster displayed in a prominent place on campus. The core content

described above was expanded upon in the lecture series. Questionnaires were also administered in conjunction with the lectures.

At Site A, a two hour lecture was presented to the young teacher association of the Biology Department. The Researcher was introduced by Biology Specialist A (see faculty seminars above), who was also the president of the young teacher's association. Then the Researcher conducted an "Introduce Yourself Survey". Next the lecture was given. A gift was presented to the Researcher and research assistant, who had typed the contents of the lecture into a portable computer. A discussion and demonstration of the computer concluded the session. (For more details on lectures at Site A see Appendix C4.)

4.3.4.4 ***Lectures at Site B***

Since the first visit and lecture at Site B was sponsored by the electronics department, the lecture emphasized optical disk technology. A questionnaire was administered in conjunction with the lecture (see Appendix C4 for details). The lecture was attended by participants from the Library department as well as from the host institute.

The second visit and lecture at Site B were sponsored by the computer group associated with the main library. Since the Library and the Library and Information Science Department at Site B were under the same administration, both were represented in the visit. In addition to presenting the lecture, the Researcher received a demonstration of their computer systems. (For more information on lectures at Sites B and F see Appendix C4.)

4.3.5 Interviews

Interviews were usually attended by an expert and one or more assistants. Interviews were conducted in English with varying degrees of translation. In order to allow participants to prepare for the interview the Researcher usually sent a list of questions describing his research interests (see Appendix B1). The first part of the interview usually focused on the interviewee and their work unit and the last part on the Researcher's interests. Interviews were often accompanied by a demonstration of computer equipment and/or a tour of the facilities.

4.3.5.1 *Interviews at Site A*

Interviews were arranged by the Coordinator with three faculty members from the host department. The first interview was with the head of the Computer Assisted Instruction research group (The Advisor). The purpose of the interview was to get information so that the Researcher could conduct a computer search for the interviewee using the Dialog OnDisc Eric system at Site G (see below). The interviewee was also involved in analyzing the results of this search (the first search mentioned above). The second interview was with a faculty member (Faculty Participant A1) and his research team to determine their information needs with respect to an artificial intelligence research project. It was learned that they had conducted a manual search of ERIC and were waiting for the library to order primary documents. The third interview was with the host department's educational psychology teacher (Faculty Participant A2) to see if her students would be interested in analyzing computer searches as part of her course. She indicated that because students were "hard

science" oriented they were not very interested in her course, much less in analyzing computer searches related to her course.

At Site A interviews were also conducted at the following locations:

1. The online search room
2. The microfiche room
3. The Educational Resources Center

(For more information on these interviews see Appendix C5.)

4.3.5.2 ***Interviews at Sites C, D, and E***

Interviews at Sites C, D, and E were similar in that they focused on the Second Beijing International Symposium on Computerized Information Retrieval and CDROM technology. Experts at these sites were involved in organizing the symposium and three of them presented papers at the symposium. Topics common to all interviews were: the organization of information institutes in China, searching of English language databases including ERIC, Chinese/English databases, dissemination of information using floppy disks, the use of various technologies with an emphasis on optical disk technology -- CDROM's and WORM's (Write Once Read Many). (For specific information on interviews at Sites C, D, and E and the symposium see Appendix C6.)

4.3.5.3 ***Interviews at Site G***

Interviews at this site were conducted in a similar manner to those at Sites C, D, and E. Experts G1 and G2 (from the Library Automation Department) were present for the first part of the first interview, which

was held in Expert G1's (department head) office. The Researcher and Expert G2 continued this interview in his office. In the first part of this interview general questions related to the Library Automation Department and the Researcher's interests were discussed. In the second part of the interview the use of CDROMs and WORMs (Write Once Read Many) was discussed.

Expert G2 accompanied the Researcher to the Abstract and Index Reading Room to see the Dialog OnDisc ERIC system, where the second interview took place. The computer searcher (Information Specialist G) demonstrated and discussed with the Researcher how they used their system and possibilities for participation in the CCERIC network. The Researcher then was given the opportunity to do a search and experiment with saving a file to floppy disk.

4.3.5.4 ***Interviews With Library Groups Outside of China***

The Researcher visited academic libraries in Hong Kong, Singapore and Canada to do a comparison with China and to see how they used ERIC. The contrast in the availability of resources between these libraries and China's libraries was immediately obvious. For example, one Hong Kong library had six CDROM players in various departments in comparison with perhaps six players in all of the libraries in China. Tied to the availability of resources is open access to information. If one had the money to pay for a computer search one could have it conducted. Because of high online costs not as many searches were conducted in Singapore as in Canada and for this reason Hong Kong libraries were using CDROM. Other

than telecommunications costs there was very little difference in the use of ERIC in Singapore, Hong Kong and Canada.

4.4 SUMMARY

A naturalistic approach to social science research, which is more intuitive and relational than structured, was used in this Study. The Independent Research Project, which focused on a case study was a major component of this approach. Other sites and groups were visited to gain a broader perspective. Data were collected through seminars, lectures and interviews. Although more information could have been gathered from a broader context, most of it would probably have either given more detail or reinforced concepts already presented in this Study. Observations on using some of the methodologies described in this Chapter are presented in Chapter Seven.

Chapter Five

Research Findings

5.1 OVERVIEW

The presentation of The Researcher's Model in Chapter Three is a general model for planning and implementing innovations. In this Chapter The Researcher's Model is applied to the presentation of the results of The Independent Research Project introduced in Chapter Four (see figure 5.1, which is a specific version of figure 3.1). As a result of this research project an initial Pilot Study plan for a network (CCERIC, Chinese Computerized Educational Resources Centers) to improve access to ERIC was developed (see Chapter Six).

As indicated in figure 5.1, the focus of The Independent Research Project was on understanding how innovations, like the ERIC database, will interact with the Chinese context (as represented by The Independent Research Project). Based on The Researcher's Model and The Independent Research Project mentioned in Chapter Four, the following topics have been identified as important to gaining this understanding:

1. Access to North American Information
2. Access to Resources
3. Networking and Cooperation
4. Motivation and Attitudes

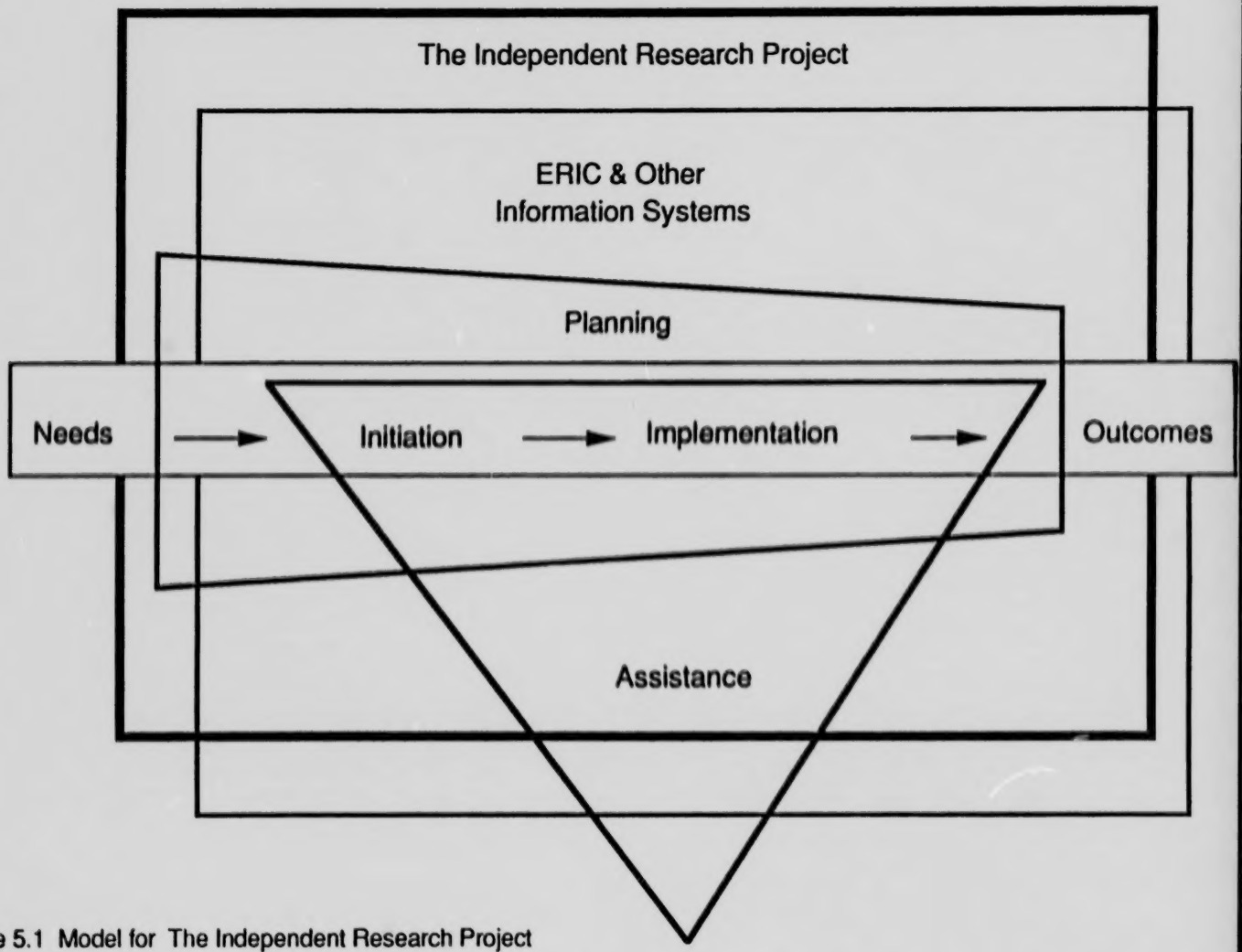


Figure 5.1 Model for The Independent Research Project

5.1.1 Data Analysis Groups

Data from The Independent Research Project introduced in Chapter Four was analyzed in relationship to the following groups:

1. Computer Based Education Group (Sites A and B)
2. The Science and Technology Group (Sites C, D, E, F)
3. The Natural Sciences Group (Sites A, D)
4. The Library Group (Sites A, B, G)

The Computer Based Education Group is the most important group to this Study because most of the activities at the case study site and many taking place at other sites were directly related to this group (for an introduction to sites visited see Chapter Four). This group differs from other groups in that it represents end users, not information specialists. The other three groups correspond to the major information structures identified by Baark (1986, see figure 2.3 in Chapter Two). All three groups provide information services and groups two and three represent end users as well as information specialists.

Since the host unit for The Independent Research Project was involved in Computer Based Education, the first data analysis group was given the title "*The Computer Based Education Group*". Although, in comparison to other groups, the Computer Based Education Group is very small and has little national influence, the Researcher's in-depth exposure to this group has provided a comprehensive understanding of end-user needs with respect to computerized information systems. Attempts to cooperate with other groups and to obtain access to resources have provided an understanding of some of the complexities involved. Working with participants and the research team has provided an insight into some of

the motives and attitudes that will affect the implementation of computerized information systems.

The Science and Technology Group refers to the many institutions in China that deal with scientific and technical information. Although some of these are formally connected with each other, most have less formal ties with each other through the China Society for Scientific and Technical Information.

The Natural Sciences Group refers to groups associated with the Chinese Academy of Science, which places strong emphasis on the natural sciences. With respect to this Study, the biology lecture group at Site A was an important part of The Natural Sciences Group. The following comment by the Research Assistant emphasises the importance of the biology lecture group: "I think that this group of teachers has great potential. They are young enough to grasp the concepts of the new technology and with the support of their leaders, will be able to advance in their fields. They are quite interested in doing computer searches and receiving... English language information from abroad".

The Library Group refers to contacts made by the researcher with library departments and departments involved in library and information science education. At the symposium mentioned in Chapter Four, the researcher had contact with three of the top library and information science departments in China. One of these was located at site A. The researcher also had contact with several library departments at Site A and B and at a major library (Site G).

5.2 ACCESS TO NORTH AMERICAN INFORMATION

The Computer Based Education Group had the least access to English language information of all the groups mentioned in this Study. First of all, they had very little direct access to FEC (Foreign Exchange Currency). Second, they only had funding to subscribe to reprinted journals from North America, and not for subscriptions to original journals published in North America. Third, there was no formal network so that resources could be shared. In comparison, The Science and Technology Group had much better direct access to FEC and computerized information retrieval systems, The Library Group had funding to subscribe to original journals published in North America, and The Natural Sciences Group had a formal network for sharing resources.

The heart of The Natural Sciences Group network is the information services network of The Chinese Academy of Science. One of the key components of this network is the use of computers to assist in publishing Chinese/English indexes to information (both books and periodical articles) in their large system of libraries (see Appendix D1). One of the reasons they have developed an integrated network is that, organizationally, information services and other branches of the organization are under the same administrative system. Since this is the only major information service in which this is true, there is much more cooperation among information services than in other organizations. As a result they have the most comprehensive system for accessing North American information of any of the groups studied. This system is not as technically sophisticated as other systems but it makes effective use of printed indexes to locally available information.

5.2.1 The Need for English Language Information

The need for English language information by the following groups was explored: faculty, teaching assistants and graduate and undergraduate students. Analysis of the invitation survey (administered to the faculty of the Researcher's Host Department, see Appendix B2) indicated that: 7 of the 20 respondents were interested in attending the lecture series, another 7 were interested in computer searching but could not attend the lectures, the remaining six were interested in either the lectures or computer searching or both as well as indicating a need for Chinese, not English information. None of the respondents indicated that they had sufficient English language information. Although 7 members of the research team did not complete the survey, their participation in the research indicated their need for English language information.

Apart from their work in an English class, most undergraduate students do not need English language information for their academic work. All undergraduate students must pass a national exam on their proficiency in a foreign language (usually English). Since most students pass this exam in their second year of studies, they do not study English for the remaining two years of their degree. Some students may need English language information for their bachelor thesis or for understanding computer manuals. Students in the English and Computer clubs at site A used English language information to increase their understanding of social issues (English club) and of computer systems (Computer club). Both groups indicated a need for more information. Many students are motivated to use English language information in hopes of being able to study abroad.

Because China places a high priority on scientific and technical modernization, The Science and Technology and The Natural Sciences Groups have a greater need for English language information than other groups studied. All of the participants in the Introduce Yourself Survey conducted in conjunction with the lecture to the biology group at Site A (see Chapter Four) indicated a need for English language information. One of the participants usually went to the department reading room every week to see if any new information had come in. The reading room librarian said there was not enough information to meet the requests. (see Appendix D5 for additional results from this survey and Appendix D2 for information on the need for English language information by The Science and Technology Group.)

Since the Library Group was more concerned with Chinese information than the other groups mentioned above, it did not have as great a need for English language information as the others. In general the Library Group seemed have a reasonable grasp of written English but had difficulty communicating orally. For example, the Researcher needed to use an interpreter more often with this group than with other groups.

5.2.2 Access to Abstracts

Other than The Librarian (a member of the research team, see Chapter Four) and one or two others, no one in the Computer Based Education Group used abstract journals and indexes to gain access to information. One of the reasons given was that, since English language magazines and journals are stored in the library using a Chinese classification system, English language indexes were not very useful. Another reason is that, since no

additional materials are available, one can look through the available material more easily than looking in the index. Many faculty at academic institutions also use other means of obtaining bibliographic references, such as reference lists in articles and personal contacts, instead of looking at abstracts. Prior to the Researcher introducing computer searches, no one in The Computer Based Education Group had any experience with accessing abstracts in this manner.

The Science and Technology Group had excellent access to abstracts through online searching, SDI (Selective Dissemination of Information) searches and printed indexes. For example, one person reported that SDI searches of the Chemical Abstracts database were distributed approximately every two weeks.

Three quarters of those attending the lecture given to the biology group at Site A used Biology abstracts. The main problem was that the abstract journal did not arrive in the reading room until six months after it was published. Some had experimented with getting abstracts through a computer search but it was not used extensively because of the cost. One person mentioned that for a specialized search he did not have access to the abstract "manuals" that he needed.

5.2.2.1 *The Use of Computerized Information Retrieval*

Prior to the Researcher presenting lectures and seminars to the Computer Based Education Group, they were aware of Computerized Information Retrieval but had little understanding and no experience in using it. Through the lectures, seminars, and analysis of ERIC records a better understanding was gained. As a result several students were interested in taking an information retrieval course, which would include Computerized Information Retrieval. Faculty and students would welcome the opportunity to do experimental searches using a CDROM system, such as Dialog OnDisc ERIC.

On the whole, The Science and Technology Group had the most experience and the best facilities for Computerized Information Retrieval of all the groups reported on in this Study. In this paragraph a summary of their services, in December of 1987, is presented. Since the telecommunications system in China is underdeveloped, online searching is limited to about 100 terminals for searching databases using foreign vendors such as Dialog and ESA-IRS (a European vendor). About 40 terminals use a small domestic online service which has records from two foreign databases. About 50 other foreign databases are searched on magnetic tape in batch mode. Domestic databases have been developed, some of which use mainframe technology and many of which use microcomputer technology. Some of these use both Chinese and English languages. Several organizations disseminate information using floppy disks and at least one organization is experimenting with the use of WORMs (Write Once Read Many) that have a large storage capacity. Many are familiar with CDROM (Compact Disk Read Only Memory) and some use it. They see it as an economical alternative

for searching foreign databases, with future possibilities for disseminating information domestically. (See Appendix D3 for additional information.)

Although The Natural Sciences Group is not as advanced in their use of Computerized Information Retrieval as The Science and Technology Group, they were the only group exhibiting CDROM systems at the symposium mentioned in Chapter Four. He (1986) indicates that searching is centralized and many obtain SDI (Selected Dissemination of Information) searches. Biology Specialist A indicated that most of the lecture group at Site A (see Chapter Four) were unaware of the advantages of computer searching, the time it can save and the additional information that can be obtained. From the comments and questions during and after the lecture the Researcher sensed an understanding of the concepts presented and an eagerness to try computer searching. Especially significant were the comments of the old professor demonstrating her understanding and encouraging her students to learn how to use the new technology. Some students wanted to read a textbook on computer searching. The Researcher pointed out that the textbook would not be as good as actual experience with a CDROM system. What is needed is a simple paper giving the basics, not a textbook. Three members of this group had experience with computer searching: one had received unsatisfactory results and the other two had not received their offline printouts yet. (See Appendix D4 for additional information on the unsatisfactory search.)

In general the library group is aware of computer searching but few have tried it. Like other groups mentioned in this Study, The Library Group is heavily involved in developing their own software. For example, one

group is developing software to access magnetic tapes when several packages are available elsewhere and at least one of them is available at no charge to China. Another example is that a reading room and a library at the same institution were developing similar databases without realizing it. If they could have agreed to develop compatible databases or used the same database system, then they could have shared files more easily and perhaps saved considerable time in developing their own system. On at least three occasions one of the first questions asked with respect to CDROM technology was related to how could they develop their own systems for accessing the information on the CDROM disk. Although the Researcher did not investigate these situations in depth, it seems that the energy spent on developing software could be better spent on developing other aspects of service. (See Appendix D3 for additional information on The Library Groups use of Computerized Information Retrieval).

5.2.2.2 ***The Use of ERIC***

Prior to the Researcher introducing ERIC records, the Computer Based Education Group at site A had little experience with ERIC. Students were aware of ERIC through a presentation in one of their courses. Some faculty had an awareness of ERIC and had limited access to some ERIC materials through the departmental librarian ("The Librarian", see Research Team in Chapter Four). A survey of the periodicals in the reading room indicated that only four of the approximately 55 English language journals were indexed in ERIC. Forty one other journals indexed in ERIC were identified, by The Librarian, as being relevant to educational technology.

As mentioned in Chapter Four, a search of ERIC using the Dialog Ondisc ERIC CDROM system was conducted for one of the faculty (The Advisor, see Research Team) in the Computer Based Education Group. An analysis of 52 records from this search indicated that 24 records were useful to The Advisor (some of these were also useful to other participants), 8 of the records were useful to others involved in the analysis, 13 of the records were considered useful to others in China and only 7 records were considered not useful to China.

An analysis of ERIC records on computers in China was conducted with students from the English club. The results indicated that the students were eager to gain better access to English language information but lacked background knowledge to decide on the importance of the information to their academic work and to the Chinese context. The analysis conducted by the Computer Club (see appendix D) yielded more positive results indicating that students could analyze ERIC searches to select information that may be useful in their academic work.

Although influential members of The Science and Technology Group were aware of ERIC, it was seldom or never used. One scientific and technical institute had recently installed a Dialog OnDisc ERIC CDROM, but did not seem to have very many users. Zhou (1987) lists ERIC as one of seven databases that should be promoted in China because of their value as indicated by extensive use in foreign countries. Comments from the lecture group at Site F (see Chapter Four) seemed to indicate some interest in ERIC especially in relationship to the use of computers in training.

The Library Group has the best access to ERIC of all the groups mentioned in this Study. Two abstract journals are published from the ERIC database, *Current Index to Journals in Education* (CIJE) and *Resources In Education* (RIE). The main library at one university had recently subscribed to CIJE and the education library at the same university had been subscribing to RIE for more than a year. Although the university did not have a thesaurus of ERIC descriptors, one of the librarians had photocopies of pages from the 1977 edition, which she had obtained from another university. This same university was in the process of developing information retrieval software to search ERIC on magnetic tape. Although this university can access ERIC on Dialog using their online terminal, no one had done so because of the cost.

Although it is not certain how many of the magazines indexed in CIJE were located at this university, one indication of the number may be the fact that the education library has 195 foreign journals and the ERIC database indexes approximately 780 journals. The Researcher was unable to find any institution in China that had a collection of primary documents indexed in RIE, most of which are available from the ERIC Document Reproduction Service either in paper copy or on microfiche.

The most comprehensive access to the ERIC database in China is the Dialog OnDisc ERIC system at Site G, mentioned in Chapter Four. This system can be used to gain access to abstracts from both CIJE and RIE for the whole ERIC database. Since the system had only been in use for a little over two months, few people had used it and policies for charging for the

service were still being formulated. The rate being considered was 20 yuan (about $5.40 Canadian) per subject searched and 20 fen (about 5 cents Canadian) per citation printed. The user would be allowed to select citations for printing. Also payment for the service would be in local currency, not in FEC (Foreign Exchange Currency). This system eliminates many of the barriers in using computer searching to obtain information in China. Although China has access to ERIC abstracts through the systems described above, access to primary documents indexed in ERIC and other North American databases is limited.

5.2.3 Access to Primary Documents

Results of The Case Study indicated that access to primary documents often depended on a network of relationships and status. Students had access to primary documents primarily through the faculty. Faculty from the educational technology department at Site A accessed them primarily through the departmental librarian and colleagues. The librarian had access through the university library system. Some would use other libraries and other means of access but this was the exception rather than the rule.

Since interlibrary loan and ordering from abroad were extremely difficult, whatever was not available locally was generally not available. Zhou (1987) states "it is also necessary to improve the interlibrary loan among information institutions and libraries, to prepare [a] union catalog of documents of all kinds so as not to seek far and wide for what lies close at hand" (p. 17-18). Gao (1987) indicates a need to overcome funding and administrative barriers in order to provide better access to primary

documents. One of these barriers is the system for subscribing to foreign periodicals. These subscriptions fall into two categories: those reprinted for distribution in China and those printed abroad. Subscriptions to reprinted materials are much easier to obtain than those printed abroad. The process of subscribing to periodicals is centralized: departmental libraries (reading rooms) submit their requests to the main library at the university and the main library submits requests to the China Import and Export Book Company. With this system of ordering a library does not know from year to year which subscriptions will be continued and which ones will be dropped. As a result incomplete periodical sets are quite common.

Some information is received through foreign visitors and other contacts from abroad. For example, the educational technology department's library (reading room) at Site A had several publications from IEEE (Institute of Electrical and Electronic Engineers). Another example is that a teaching assistant photocopied a whole text book lent to him by the Researcher. This teaching assistant was fortunate to have enough photocopy tickets or connections to do the photocopying. Another person to whom the Research had lent materials indicated that he had hand-copied several paragraphs.

The Science and Technology Group had better access to primary documents than the other groups reported on in this chapter. For example, in the survey conducted by Huang and Zhao (1987) only 9.25% indicated that obtaining original documents was a major reason "for not using computerized information retrieval". Those attending the lecture given to the biology group at Site A estimated that they were able to obtain primary documents for about one-third to less than one-half of the

abstracts they were interested in. The process of obtaining primary documents was to first look in their reading room and then in the library and finally to consult the Chinese Academy of Science book and order the document. Obtaining documents from the Academy of Science would take about two months. A few of those attending the lecture would write to the author to get important documents. No one was able to purchase documents from abroad. (See Appendix D5 for additional information on a survey conducted with this lecture group.)

5.2.3.1 ***Sources of Primary Documents***

Most departments in Chinese academic institutions have a reading room, which is usually the main source of information for most academic work. A brief review of an extensive listing of the periodicals in the reading room of the educational technology department at Site A indicated that about three or four of the approximately 55 periodicals listed were directly related to education and the others were mostly technical publications. Several publications of IEEE were not included in this review. Undergraduate students generally do not have access to departmental reading rooms except to obtain information for their bachelor thesis. In terms of educational technology information the reading room at site A may have one of the best collections in China.

Since the main library of a university controls the funding for acquiring information from abroad, it may provide better access to information in some areas than departmental reading rooms. Certain rooms of the main library are accessible to different groups, such as undergraduate

students, graduate students and faculty. At Site A, access to information on microfiche was only available through the main library.

For some subject areas, such as Science and Technology, China has major information institutes located in major cities. These institutes are often the best source of information for certain subjects. China also has a national library and some major municipal libraries. These libraries depending on the subject matter may have more information than a university library. Some scholars use these libraries as a secondary sources of information.

Many Chinese academics rely on their personal connections to gain access to information. Most faculty try to obtain as much information in their personal collection as possible, and selectively share this information with others. One faculty member mentioned that he had a sister who worked in a library of the Chinese Academy of Science and she got him most of the information he needed. Others use their connections abroad or write to the author(s) of an article to obtain primary documents. Obtaining primary documents is closely related to access to resources such as FEC.

5.3 ACCESS TO RESOURCES

Throughout The Independent Research Project, three systems of controlling access to resources were observed: one was direct monetary control, a second was control of equipment and materials, and the third is control over personnel. Since these systems operate separately, providing more money to a project may be of little benefit to the project because additional personnel and materials can not be obtained by using the money.

5.3.1 Access to FEC (Foreign Exchange Currency)

China has two currencies: Renminbi for normal transactions within China and FEC for transactions involving international trade. Since access to North American information depends on FEC, the use of renminbi is not considered in this Study except as it relates to the use of FEC (see Appendix D6 for additional information on the experience of foreigners relation to FEC and Renminbi). Since the Computer Based Education Group had little or no direct access to FEC, they were usually not able to independently obtain information from outside China.

With respect to funding for computerization, The Science and Technology Group had second overall national priority, next to the computerization of the financial system. Although this group seems to be better funded than other groups, the second most frequently mentioned reason in Huang and Zhao's (1987) survey "for not using computerized information retrieval" was lack of funds (21.7%).

5.3.2 Access to Equipment

As described in Chapter Four, obtaining specialized equipment, like a CDROM player, from outside of China is a complex and difficult process. Also, once equipment is received and allocated to a group, it is extremely difficult to transfer it to another group. Therefore, groups exchange favours for using each other's equipment. Another problem related to the use of equipment is that if it breaks down it is usually extremely difficult to get repaired. For these reasons equipment, especially

equipment that is not readily available, is usually underutilized. Another reason equipment may be underutilized is a lack of trained personnel.

5.3.3 Availability of Personnel

As mentioned in Chapter Two, there is a shortage of middle-aged faculty. In order to meet this shortage China is training graduates as teaching assistants. These teaching assistants will be the primary source of personnel for implementing systems to access North American information. Assistants who are most capable of doing this usually find opportunities to study abroad. Since these people are still considered part of a work unit's personnel quota, replacements are difficult if not impossible to obtain. The Computer Based Education Group at Site A suffers from this type of personnel shortage.

In contrast, the biology lecture group at Site A, had a good group of young teachers, who could assist in implementing end user systems. One personnel deficiency was that a person from the foreign language department had replaced a biology information specialist, who was abroad studying. The replacement person did not understand biology or computer searching.

5.4 COOPERATION AND NETWORKING

The process of conducting The Independent Research Project mentioned in Chapter Four provided an excellent opportunity to observe how networking and cooperation take place in Chinese academic society. Firstly, formal

cooperation is very difficult to obtain. Secondly, informal cooperation is easy to obtain if a network of relationships is established between cooperating groups and those groups have the funding and power to complete the cooperative effort. Networking and cooperation in China, especially formal cooperation, depend on leadership support and influence.

5.4.1 Formal Cooperation

At Site A (the case study site) several attempts were made at obtaining formal cooperation and all but two of them had failed, were delayed or were stalled by the bureaucratic process. The ones that succeeded did so because the Researcher and research assistants were persistent and additional funding from abroad was available through cooperation. Sometimes external funding can produce formal cooperation on the surface but informal cooperation is needed if a project is to ultimately succeed.

Formal and semiformal cooperation within The Science and Technology Group takes place through the China Society for Scientific and Technical Information. This society promotes the development of and adherence to national standards. Within the society, as expressed by Gao (1987) and Shen, Li and Xiao (1987), there is a general consensus of the need to coordinate and encourage individual efforts in conjunction with an overall plan. If Shen et al's recommendation that systems should rely primarily on internally developed software were applied to China as a whole, to promote the use of software developed in China, then it would definitely contribute to an overall national plan. What is happening in practice is that each unit is developing software similar in function to that of other units and often incompatible with it. Gao indicates that a national plan

should consider long term development along with urgent short term needs; and that both economic and social benefits need to be considered, with an emphasis on social benefits. In order to realize maximum social and economic benefits, national plans for information systems need to consider cooperation and networking of independent work units.

The formal network of the Academy of Science is the most developed network observed by the Researcher. Their interlibrary loan system seems to be functional and adequate compared to other systems in China. Formal access to this network, like that of the biology lecture group at Site A, was not as effective as the informal access the faculty member, mentioned above, had through his sister.

5.4.2 Informal Cooperation

Informal cooperation depends on a network of relationships held together by the exchange of favours (guanxi, see Chapter Two). The Independent Research Project was conducted through a series of exchanges of favours. Informal cooperation with clubs and societies, such as the English and Computer clubs mentioned above and the society for Computer Based Education, is easy to obtain because of the semiformal structure of these groups. Through informal cooperation the researcher was able to arrange for lectures and interviews. In some cases informal arrangements needed to be formalized, by receiving leadership approval.

Because a foreigner is a temporary resident of China, he or she has a better opportunity to develop relationships with independent groups and

thus foster informal cooperation. This informal cooperation needs to then be formalized through leadership support if it is to continue.

5.4.3 Leadership Support

Leadership support often affects cooperation. Leadership support for The Independent Research Project at the departmental and research group level was strong but was weak at higher levels. The Researcher had support from his Canadian supervisor and department as well as his Chinese supervisor, who was the head of the host institution. The Coordinator had support of his supervisor, who was the head of the Computer Based Education Group. Although the President of the university was supportive, the financial affairs and other offices were able to overrule him. The Researcher had several people suggest that he needed to convince their leaders before anything could take place.

The Science and Technology Group seemed to have strong leadership support for Computerized Information Retrieval. For example, although more than 50% of those who completed Huang and Zhao's (1987) survey were not senior personnel, less than 3% gave lack of director support as a major reason for not using Computerized Information Retrieval. As mentioned earlier, the support of the old professor who attended the biology group lecture at Site A was obvious. This type of cooperation between old and young is an example of how older people can use their influence to gain support for young people's initiatives.

5.4.4 Influence

Both formal and informal cooperation, within a network, depends on influence, especially that of leadership. For example, since the Researcher's host was very influential within the Computer Based Education society, cooperation with respect to this group was relatively easy to obtain. On the other hand, cooperation with library groups was difficult to obtain because the Researcher's host had very little influence within this group. Because the Computer Based Education Group is small and is not high priority, it did not have very much leverage nationally.

In contrast, The Science and Technology Group had considerable national and international influence. For example, they were able to get senior personnel from international organizations at their symposium and to arrange a meeting with the minister in charge of the State Scientific and Technical Commission. With respect to Computerized Information Retrieval they are the most powerful in China. Other significant groups are The Chinese Academy of Science, The Library and Information Science Department at Site A, and the Site G library. Cooperation with influential groups such as those mentioned above is essential, if one is to successfully implement information networks in China.

5.5 MOTIVATION AND ATTITUDES

In China people are motivated to get involved with the current trend, which is modernization and economic reform. Participation in The Independent Research Project was motivated by several factors related to modernization. Some wanted to demonstrate their modern equipment and

methods. Others were motivated by the status of having a foreign guest. Others wanted to obtain funding from abroad. Some wanted to practice English or prepare themselves in other ways to study abroad. Most genuinely wanted to improve the economic and academic conditions of their country and themselves.

The Researcher was specifically motivated by a need for a site to conduct his research, the Coordinator by a need to be better prepared to study abroad, and the Supervisor by academic status. The host department was motivated by status and the potential of foreign funding as well as the lecture content, while the host university was motivated by obtaining foreign funds.

Since the bulk of the work for implementation of new systems is difficult, young implementers need to be motivated to continue over a long period of time. The Coordinator used the illustration of trying to get a heavily loaded truck (loaded with many Chinese people) moving, once it is moving it is hard to stop but it takes a lot of energy to get it rolling. The Researcher used the story of the little engine who pulled the train over the mountain with determined, persistent effort. Progress in reaching a long term goal needs to be measured in short term results in order to maintain motivation and commitment. One of the factors contributing to motivation in implementing an innovation is openness to change.

5.5.1 Openness to Change

An attitude which affects the implementation of an innovation is openness to change. As can be expected, young people are more open to change than

older people. People who have gone to North America or plan to go are usually more open to North American innovations than others. At site A, both the supervisor and two of the advisors for The Independent Research Project had spent time in North America. They were more open to the project than other staff who had not been overseas. Young people, both staff and students, were open to change but indicated that they needed faculty support to implement these changes. Being too open to change can be a danger, in that one accepts new ideas without evaluating how they relate to established systems and values. The combination of old and young working together, where both are open to change and have a respect for established values and systems, is the ideal balance.

5.6 SUMMARY

The results of The Independent Research Project and this Chapter are presented below. Using The Researcher's Model as a guide, the results of The Independent Research Project are sumarized in table 5.1. Each statement is considered generalizable to China and examples from The Independent Research Project are given to support that statement. The anticipated generalizability to other LDCs (Less-Developed Countries) and to North America (N. A.) is also indicated. Of the thirty-seven statements in the table, 49% are generalizable to other LDCs, 40% are partially (Part) generalizable to other LDCs, and only 11% are not generalizable to other LDCs. Only two statements (5%) are generalizable to North America. These statements relate to technical competence and are partially generalizable to other LDCs. Fourteen of the statements (38%) are partially generalizable to North America. One of these statements which refers to the efficiency of the postal system is not generalizable to other LDCs.

Table 5.1
Generalizability of Research Findings

Research Findings	Generalizability		
	China	LDCs	N.A.
Needs			
Selected groups, such as scientists, graduate students, and young teachers, need English language information (see section 5.2.1).	Yes	Yes	Part
For these groups demand for English language information exceeds the availability of that information.	Yes	Yes	
Some participants like those from the Computer Based Education group needed better access to abstracts, while other like those from The Biology Group at Site A had good access to abstracts (see section 5.2.2).	Yes	Part	
There is a general need for better access to primary documents (see section 5.2.3). For example, none of the participants indicated that they had a means of accessing all the primary documents which were relevant to their needs.	Yes	Yes	Part
There is a general need for education with respect to the use of Computerized Information Retrieval. Prior to the Researcher presenting lectures and seminars to the Computer Based Education Group, they were aware of Computerized Information Retrieval, but had little understanding and no experience in using it (see section 5.2.2.1).	Yes	Yes	
Selected educators, such as those involved in Computer Based Education, need access to ERIC.	Yes	Yes	Part
Initiation			
Leadership approval at all levels is essential for a joint research project (see section 5.4.3).	Yes	Part	Part
International joint research projects are often tied to funding from a developed country.	Yes	Yes	
Implementation			
For implementation to be successful, leadership support at the local level is essential (see section 5.4.3).	Yes	Part	Part

Although technical implementation of systems like the CDROM system at site G has taken place, social implementation is incomplete (see section 5.2.2.1).	Yes	Yes	Part
Outcomes			
Technical implementation of information systems, like the online search facilities at site D, is stable and institutionalized (see section 5.2.2.1).	Yes	Part	Yes
Some areas of the academic community such as those involved in science and technology have benefited from using information system, while others like The Computer Based Education Group have not (see section 5.2.2.1).	Yes	Yes	Part
The implementation of Chinese information systems, like cdBase III systems (a CCDOS version of dBase III), has been influenced by the implementation of systems for accessing North American information.	Yes	Yes	
The Innovation			
There are sufficient computing power, technical expertise, and information systems to meet immediate needs for access to North American databases like ERIC.	Yes	Part	Yes
Although several methods of accessing ERIC abstracts are technically available, only site G has access to the whole ERIC database (see section 5.2.2.2).	Yes	Part	
There is no means of accessing ERIC documents (see section 5.2.2.2).	Yes	Part	
The Context			
Electrical power is sometimes not available. For example, one university, to conserve power usage, went without power on occasional Fridays.	Yes	Yes	
Electronic communication is non-existent or limited. For example, the telephone lines at site A would not support a 1200 baud modem.	Yes	Yes	
The postal system is efficient - local letters take two or three days, and letters between major centers take about a week.	Yes		Part
A technocratic approach to innovation was predominant. For example, the emphasis of the interview with personnel from the online search room at site A was on their search system, not their service.	Yes	Part	Part

The traditional role of the teacher as disseminator of information hindered student access to information. For example, students from the English club desired to access English language information in relationship to their studies but were hindered by the traditional system.	Yes	Yes	
The work unit is the central social unit and is isolated from other units. For example, the researcher could not visit a friend's work unit because arrangements had not been made by his host department (see section 2.3.1).	Yes		
Interpersonal relationships and exchanges of favours are important in accomplishing a task. For example, most of the researcher's activities outside of his host department were accomplished by this means (see sections 5.4.2 and 2.3.2.3).	Yes	Yes	Part
Central control is maintained through a hierarchical structure. For example, The State Education Commission controlled The Independent Research Project through the host university, which controlled the host department (see section 2.3).	Yes		
Party politics affects most areas of academic life. For example, a teaching assistant was hindered in advancing academically because he had refused to enforce party policy.	Yes	Part	
Informal cooperation can be formalized through leadership support. Cooperation at Site A was hindered because this did not take place (see section 5.4.3).	Yes	Part	Part
Participation in international joint research is motivated by foreign investment (administrators), status (academic leadership) and study abroad (young teachers and students), (see section 5.5).	Yes	Yes	Part
People who had little or no knowledge of English, like those from industry attending the lecture at site F, were more open to technical change than social change (see section 5.5.1).	Yes	Part	
Assistance			
After technical implementation is complete, very little monitoring other than economic monitoring is done. For example, the library at site G was concerned about how much to charge for ERIC searches but not about obtaining primary documents.	Yes	Part	Part

North American information usually arrives at its local destination (i.e. libraries at site A) about six months after publication.	Yes	Yes	
Except for networks like the Chinese academy of science system, access to information was limited to locally available information or to large information services (see section 5.2).	Yes	Yes	
Although most operators of Computerized Information Retrieval systems are adequately trained, other information specialists and end users have little training. For example, the operator of the Dialog OnDisc ERIC system at site G was adequately trained and the librarian and end users from the Biology group at site A had no training (see section 5.2.2.1).	Yes	Part	
Planning			
Computer systems are generally implemented without comprehensive planning, especially for social implementation. For example, although there was some evidence that planning in terms of technical implementation of the online search system at site A had taken place, there was no evidence of planning for the development search strategies.	Yes	Yes	Part
Policies are not formally stated and are locally interpreted. For example, many of the policies regarding the Researcher's status were not formally stated and each work group within the university had their own interpretation of those policies (see section 3.7.1).	Yes	Part	
Although strategies for technical implementation are often well developed, strategies for social implementation are limited or non-existent. For example, although Sun (1985) mentions several strategies for technical implementation, she only mentions a strategy for automating manual procedures and no strategy for meeting user needs (see section 2.4.3).	Yes	Part	Part
Operational plans can change at any time depending on the immediate need. For example, the Researcher would be asked at the last minute to attend a function because a leader had requested his presence.	Yes	Yes	

note LDCs -Less-Developed Countries
N.A. -North America
Part -Partially generalizable

Statements found in Table 5.1 refer to both technical and social implementation. Technical implementation has taken place when an innovation is functioning as designed. Social implementation has taken place when the intended users of the innovation are using it effectively. For example, although Computerized Information Retrieval is technically routine to those who have equipment for this purpose, most potential end users consider Computerized Information Retrieval a very specialized method of accessing information and have had little or no experience using it.

In this Chapter the results of The Independent Research Project introduced in Chapter Four are presented in relationship to gaining an understanding of how innovations, like the ERIC database, will interact with the Chinese context. Four groups have contributed to this understanding: contacts with the Computer Based Education Group provided an in depth insight into academic life in China and the needs of end users, the Science and Technology Group gave insight into Computerized Information Retrieval, the Natural Sciences Group verified the need for English language information and an example of a cooperative network, and the Library and Information Science Group provided insight into difficulties in obtaining primary documents and insight into the use of ERIC in China. Insights into Access to Resources and Motivation and Attitudes were also presented in this Chapter. The results presented in this Chapter have been used in Chapter Six to develop an initial plan for a Pilot Study into the implementation of a network (CCERIC, Chinese Computerized Educational Resources Centers) to improve access to the information indexed in ERIC and to develop The Cooperative Information Systems Model presented in Chapter Seven.

Chapter Six

Discussion

6.1 OVERVIEW

The Researcher's Model, presented in Chapter Three and used as a guide for data analysis in Chapter Five, is discussed in this chapter in relationship to a specific innovation, CCERIC (Chinese Computerized Educational Resources Information Centers), to be implemented in a specific context, Chinese Academic Institutions (see figure 6.1).

Since the planning process is central to the Researcher's Model, it is the focus of the discussion of results presented in this chapter. Informal planning started early in The Independent Research Project, which is presented in Chapters Four and Five. About half way through the project the concept of CCERIC began to emerge, and informal plans for implementing it were discussed. Formal planning did not commence until after data from the project had been analyzed. The formal planning process is the focus of this chapter. The first stage of this process was the development of an initial plan, which is referred to as The Preadoption Plan for implementing CCERIC. This plan was analyzed using The Researcher's Model as a guide. The results of this analysis, presented below, were used to develop a Pilot Study Plan, also presented in this chapter, to study the feasibility of implementing CCERIC. Prior to a discussion of these plans, an overview of CCERIC is presented.

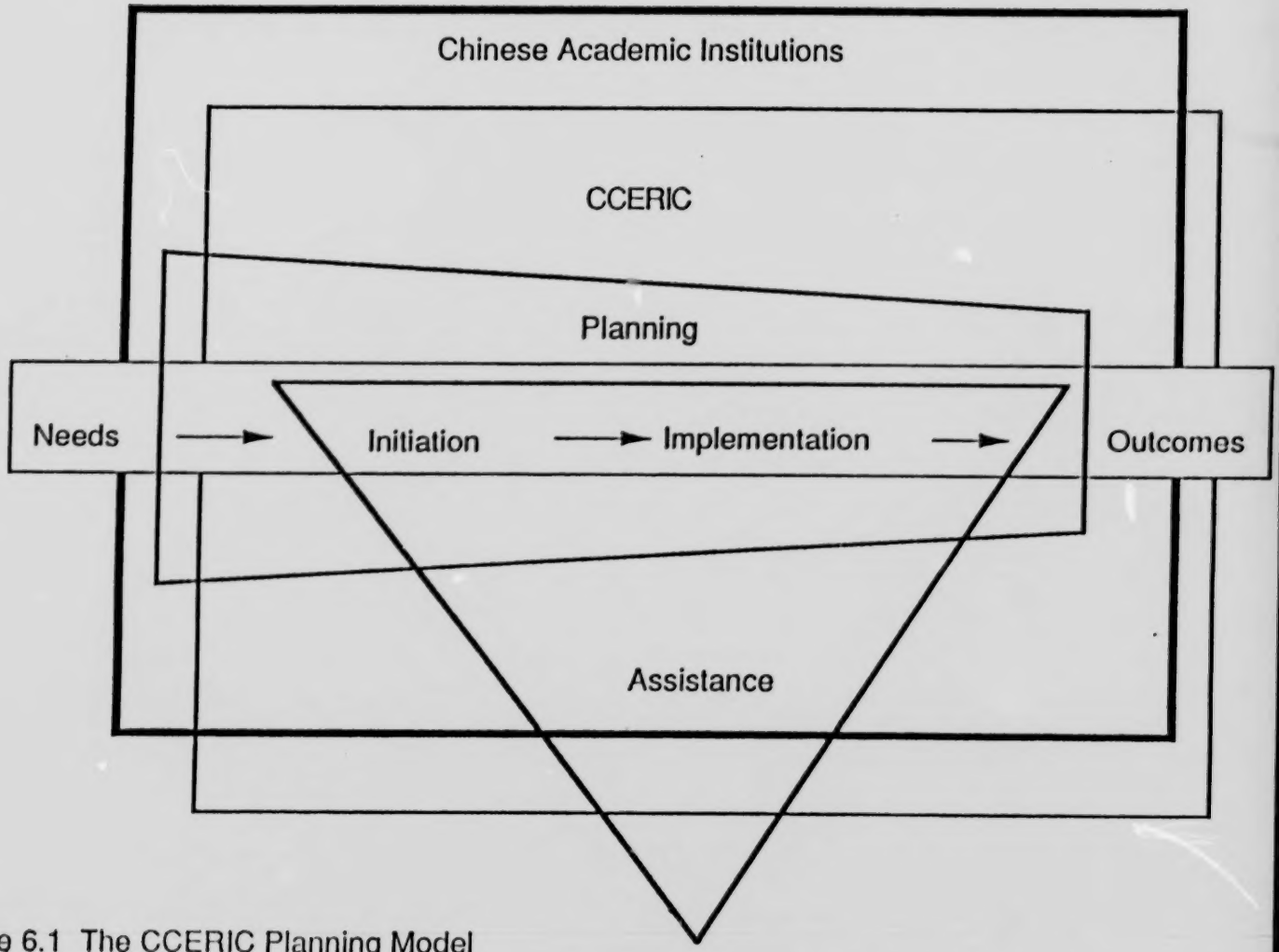


Figure 6.1 The CCERIC Planning Model

6.1.1 An Introduction to CCERIC

CCERIC is a proposed network of information centers in the People's Republic of China. The purpose of the network is to provide access to both Chinese and English educational information, through the use of computers. The basic theory behind CCERIC is that the cooperative implementation of a network of compatible computerized information systems has a "Relative Advantage" (Rogers, 1983) over current methods of independently implementing incompatible systems. Rogers defines "Relative Advantage... [as] the degree to which an innovation is perceived as better than the idea it supersedes" (p. 15). The CCERIC network would provide access to information indexed in the ERIC database and other information from North America, as well as Chinese information. The CCERIC network would consist of national and regional clearing houses and coordination centers as well as local dissemination centers.

Clearing house networks would be set up to parallel ERIC clearing houses, but organized according to Chinese subject classifications. For example, the ERIC "Information Resources" clearing house would be parallel to two Chinese clearing houses: one for Educational Technology and the other for Library and Information Science. Each clearing house network would consist of a national clearing house, several regional clearing houses and a number of subject groups and dissemination centers. Subject groups would be part of existing societies such as the Society for Computer Based Education. National and regional clearinghouses would have compatible computer systems so that all records contained in CCERIC would be available at each site. Analyses of ERIC records and other documents (both Chinese and English) would either be done by using a computer system or coding sheets for entry into a computer. These analyses would be

synthesized at the national clearing house and disseminated to regional clearing houses and local dissemination centers. Records would also be sent to the national CCERIC computer center for dissemination to regional coordination centers and dissemination centers not connected to a clearing house network. Dissemination would take place both in computer and printed format.

6.1.2 The Development of CCERIC

The concept of CCERIC was developed midway through The Independent Research Project presented in Chapters Four and Five. It developed from the following observations:

1. China was in the early stages of implementing computerized information systems.
2. There was widespread use of CCDOS (Chinese Character DOS) systems.
3. Information was being disseminated using floppy disks.
4. Records from the ERIC database could be made available in China on floppy disks.
5. Selected records from the ERIC database were useful for academic work in China.
6. The need for cooperation in implementing information systems and accessing primary documents was recognized by Chinese leaders.

Various aspects of the original concept were tested and discussed with participants in The Independent Research Project, resulting in the recommendations and invitation presented in Appendixes E4 and E5 respectively. After the data analysis presented in Chapter Five, The Preadoption Plan described in Appendix E2 was developed. This plan is analyzed below using The Researcher's Model presented in Chapter Three as

a guide. Based on this analysis The Pilot Study Plan, also presented below, was developed.

6.2 AN ANALYSIS OF A PREADOPTION PLAN FOR CCERIC

In this section The Researcher's Model presented in Chapter Three is used to analyze an initial preadoption plan (see appendix E2) for CCERIC (Chinese Computerized Educational Resources Information Centers). This analysis is presented below using the major headings from The Researcher's Model. Specific factors represented by the model are italicized for easy reference. The major outcome of the analysis is the development of The Pilot Study Plan presented in the next section. The analysis also makes reference to a comprehensive plan which will be developed as a result of The Pilot Study.

6.2.1 Needs Analysis

The needs analysis section of the Preadoption Plan for CCERIC (see Appendix E2) was modified for The Pilot Study Plan to increase *clarity* and to present needs in order of *priority*. In the Preadoption Plan, needs were discussed in paragraph format with no consideration for priority. A prioritized list was developed for the Pilot Study Plan.

6.2.2 Initiation

Since The Preadoption CCERIC Plan discussed in this chapter represents the initiation stage of The Innovation Process, other factors are considered in relationship to initiation. In developing this plan,

several *innovations* such as: Chinese and English information systems, systems for accessing primary documents, methods of accessing the ERIC database, and various parts of the ERIC system have been considered.

6.2.3 Implementation

In analyzing The Preadoption CCERIC Plan, implementation was considered in a future sense by: experimental *uses of materials* such as ERIC records and CDROM systems, an analysis of current and future *activities and practices* affected by CCERIC, and attempting to determine how *beliefs and understandings* will effect or be affected by CCERIC. During The Pilot Study a more explicit study, especially into beliefs and understandings, should be conducted. Philosophical approaches mentioned below should be considered in relationship to the study of beliefs and understanding.

6.2.4 Outcomes

Since full implementation of a comprehensive CCERIC plan is expected to take five to ten years, outcomes need to be measured at various phases in the process, starting with The Pilot Study phase. *Stabilization, dissemination,* and *institutionalization* of parts of the CCERIC network are expected to take place during each phase of the overall long term implementation process. An expected *direct impact* of CCERIC is improved access to ERIC. *Indirect impacts* may be: increased access to other resources, and cooperation among participants in other areas. In order to accommodate *job mobility,* in terms of young people wanting to study abroad, the CCERIC plan proposes two year periods of study abroad during which participants would be involved part time in the research.

6.2.5 The Innovation

Since the complete CCERIC network is *complex to implement*, broad in *scope*, and large in *scale*, various parts of the network need to be implemented in phases; so as not to create too great a *demand on resources*. An initial analysis of the *usefulness* of ERIC has taken place through The Independent Research Project mentioned in Chapter Four. An analysis of the usefulness of CCERIC will take place through The Pilot Study. In developing the comprehensive CCERIC plan, Chinese and ERIC systems need to be studied; so that optimal *contextual fit* can be obtained. As mentioned in Chapter Two (Lam, 1987), minimizing changes to end-user systems by maximizing changes to computer systems and procedures involving specialists will produce end user systems with optimum contextual fit. In order for this to take place, the implementation of an innovation needs to be studied in relationship to the context in which it will be implemented.

6.2.6 The Context

Since the context is considered in detail in Chapters Four and Five, this section presents only the highlights. Because *philosophical approaches* were not directly considered in Chapters Four and Five, they are discussed in detail in the opening paragraphs of this section.

In relatively recent Chinese history two major competing philosophies have been present, those of the traditionalist and those of the modernist. Traditionalists hold to traditional Confucian ideals and practices (see

Chapter Two), while modernists have imported and modified Western ideals and practices such as Socialism, Technocracy and to a lesser extent Democracy and Therapeutics, (see Chapter Three). Today different philosophies are being applied to different areas of Chinese life with varying degrees of penetration. The overall philosophy is still socialist and government policies are developed accordingly. With more freedom since the Cultural Revolution, some traditional values are being revived. In areas affected by the four modernizations, China is becoming more technocratic and materialistic. In education both socialistic and western philosophical approaches tend to be therapeutic. The events of June 1989 indicate that the current philosophical approach of the government strongly favours centralized control. Various philosophical approaches represented in different sectors of Chinese society need to be considered in developing plans for implementing an innovation.

In order to select and implement an innovation that is "best" according to the various philosophies represented, the Researcher proposes that a transcendent approach be used. The innovator transcends various philosophies represented in the context to determine how to select and implement an innovation in such a way as to integrate major philosophical approaches. In a society as complex as China and with the Researcher's limited exposure to this society, one's attempt to use a transcendent approach must be limited. This limitation has been overcome to some extent by discussions with and suggestions from the Coordinator (see "Research Team" in Chapter Four), who also has a transcendent approach to innovation. The Coordinator was limited by his exposure to technology and other systems related to the development of CCERIC. Thus, the Researcher and the Coordinator complemented each other in their attempts to transcend

the context and the innovation in order to develop a plan which would incorporate the "best" features of both.

Other factors related to the context are briefly discussed below. *Physical conditions*, such as the availability of computers, electricity and communications facilities need to be considered. With respect to *social organization*, the networking of autonomous work groups is not a common practice and will require special skill and persuasion to accomplish. This task could be approached both from the "top down" and the "bottom up" at the same time. So far the bottom up approach has been used; the Researcher and his host have used their *influence* to obtain informal *cooperation* and support from potential users. The Pilot Study needs to continue to foster informal cooperation and to develop formal cooperation through leadership support. The role of an "Outside expert" and the community (Havelock and Huberman, 1977) and Hayhoe's (1989) model for cooperation have been and will continue to be important to the development of CCERIC.

Two aspects related to *motivation and attitudes* not specifically emphasized in Chapter Five are administrative pressure and commitment. These aspects of motivation and attitude are incorporated or assumed in other discussions. Administrative pressure assumes a top down approach and can be effective or can create resistance if users are not committed. With respect to *change*, The Comprehensive CCERIC Plan should allow for technological change. One of the major functions of research conducted in Canada would be to examine changes in information systems technology. One *other contextual factor* which needs to be considered by The

Comprehensive CCERIC Plan is the use of both Chinese and English languages.

6.2.7 Assistance

Each group participating in CCERIC would *monitor* their own progress and report to a coordinating body (committee). *Administrative latitude* must be sufficient for autonomous groups to develop their own systems but not so much as to hinder *networking* with other groups. Although Canadian researchers would be hosted by a particular group in China, they would be available to provide assistance to various groups as needed. These researchers would also monitor *cooperation* and *resource acquisition and utilization*, especially the use of Canadian funds. They would also be involved in training and skill development, which should be an integral part of The Comprehensive CCERIC Plan. Havelock and Huberman's (1977) comments on resource acquisition and utilization should also considered in developing The Comprehensive Plan.

6.2.8 Planning

The Preadoption Plan analyzed in this section was a start toward developing The Pilot Study Plan presented below, which should result in a Comprehensive CCERIC Plan. The Researcher's Model and accompanying checklist, especially Havelock and Huberman's (1977) comments related to planning should be considered in developing these plans. Various factors represented by the model need to be considered in more detail as the planning process continues.

6.2.8.1 *Use of The Researcher's Model*

In this Study, The Researcher's Model developed in Chapter Three was used in an iterative manner to assist in planning. For the first iteration the model was used in a general sense, to develop the framework for data analysis presented in Chapter Five and The Preadoption Plan for CCERIC outlined in Appendix E2. For the second iteration the model was used in a more detailed sense in the analysis of this Preadoption Plan, which is presented in this section. The third iterative use of the model was in the development of The Pilot Study Plan presented below. It is expected that the model would continue to be used throughout the planning process in a similar manner, with different aspects of the model being emphasised with each iteration.

The major value of The Researcher's Model seems to be in organizing one's planning strategy and in identifying factors which one may not consider apart from using the model. Use of The Researcher's Model, in the above analysis, indicates that it is complete as far as the major factors identified but needs development in terms of the presentation of specific factors. For example, the Researcher experienced difficulty with classifying factors such as "Economics" and "Resource acquisition and utilization" either under "assistance" or "context". These factors are closely linked and should be considered together. Other concepts such as "Leadership support" may need to be identified as separate factors. (In Chapter Five leadership support was considered separately from "influence" and in Chapter Three as part of influence.) Further theory sampling is needed to discover specific theories related to the implementation of

CCERIC and to improve The Researcher's Model (see Observations On Using The Researcher's Model in Chapter Seven).

6.2.9 Summary

The above analysis of The Preadoption Plan for CCERIC indicated that the some sections of the plan could be incorporated with minor modifications into The Pilot Study Plan presented below. Some sections of The Preadoption Plan needed major revision and other sections needed to be added to make The Pilot Study Plan complete. If The Preadoption Plan had been analyzed without the use of The Researcher's Model, it is likely that many of the modifications and additions to the plan would have been overlooked.

6.3 AN INITIAL PLAN FOR A PILOT STUDY OF CCERIC

Although the Study presented in this thesis has been limited, especially by access to resources; the results indicate a potential need for a network to provide better access to ERIC. Rogers (1983) states that "A technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome" (p. 12). Using this view of technology, CCERIC (Chinese Computerized Educational Information Centers) is a technology which reduces the uncertainty of accessing educational information by the Chinese academic community. Since CCERIC is in the beginning stages of development, widespread adoption is not feasible. In order to test the feasibility of CCERIC and to further develop the technology, the Researcher proposes that a Pilot Study be conducted involving two or three

Chinese sites and one Canadian site. The Pilot Study would involve both Chinese and Canadian researchers and be jointly funded. An initial plan for this Study is presented below using the following headings: Expected Outcomes, Needs Analysis, Access to Resources, Cooperation and Networking, Philosophical Approaches, Benefits, Policies, Strategies and Operational Plans.

6.3.1 Expected Outcomes

As a result of The Pilot Study it is expected that:

1. A comprehensive plan for implementing CCERIC will be developed, including plans for the development and implementation of computer systems.
2. Initial subject networks will be implemented for Computer Based Education and Educational Library Automation.
3. Initial regional and national networks will be implemented for searching ERIC and obtaining primary documents.
4. Initial educational programs on computerized information systems and the CCERIC network will be implemented.
5. An ongoing joint Canada/China research project will be implemented.

6.3.2 Needs Analysis

Although a formal needs analysis has not been conducted, the following needs have been identified and are presented in the order of their priority.

1. Further research is needed into the implementation of "Cooperative Information Systems" in Chinese academic institutions.
2. Systems need to be implemented so that access to both Chinese and English information is improved.

3. Information specialists and end users need experience with computerized information retrieval so that they can evaluate its potential usefulness.

4. A network of information centers is needed so that resources related to the ERIC database can be shared.

5. Funding, especially FEC (Foreign Exchange Currency), is needed so that additional resources such as primary documents can be obtained.

6.3.3 Access to Resources

Providing access to resources is at the heart of the CCERIC concept. For CCERIC to be implemented, access to resources both inside and outside of China is needed. Access to resources outside of China requires FEC (Foreign Exchange Currency), which is not available to most of the people who need access to information indexed in ERIC. Additional FEC for CCERIC would need to come from high levels of government or from abroad. Access to resources within China requires various groups cooperating in a network.

Access to personnel is a problem both within China and outside of China. The problem of access to personnel outside of China can be solved by funding. The problem of access to personnel inside China could be solved by a joint research agreement. Funding without a joint long term research agreement would only provide temporary access to personnel, who would either move on to another project or go abroad to study.

6.3.4 Cooperation and Networking

National and regional cooperation could produce a network of information centers to provide better access to existing information (both Chinese

and English) in China and corporate access to information outside of China. Initially, regional cooperation could center around sites A and B and national cooperation around sites A, B, and G (for a description of these sites see Chapter Four). Although sites A and B are already working on plans for regional systems and perhaps national systems, these plans do not include the development of compatible computer systems or the cooperation between the two sites or with site G. Although some cooperation exists between various groups at site A, further cooperation is needed if better access to ERIC is to be achieved. For example, if the educational CDROM system mentioned above is to be implemented, two groups at site A need to cooperate. Site A may also need to cooperate with site G to get complete access to bibliographic records in the ERIC database. Site B will need to cooperate with site G to gain access to the ERIC database. All groups with periodicals indexed in ERIC will need to cooperate to provide better access to primary documents indexed in ERIC. A first step towards cooperation in accessing primary documents would be for each group to list the periodicals they have (see invitation to participate in CCERIC, Appendix E5). In order for cooperation to take place senior leadership support needs to be obtained.

6.3.5 Philosophical Approaches

Various philosophical approaches, recently (May, 1989) reported by western media in relationship to student demonstrations, are evident at all levels of Chinese society, not just at the national level. Although events in June, 1989 have reinstated centralized control as the dominant philosophical approach in China, how this control is implemented varies from one work unit to another. Young people (those who entered university

after The Cultural Revolution) generally are more open to cooperation with others to produce a better society and to get ahead personally. Older people tend to build a strong work unit so that others, of necessity, need to cooperate with it. Most Chinese, young and old, cooperate with others on a personal basis by exchanging favours. This type of cooperation often extends to work groups cooperating with each other.

If the CCERIC network is to be successful, various philosophical approaches need to be taken into consideration. Informal cooperation among young people, with the goal of building a effective system for accessing ERIC, needs to be mixed with leadership support, through the centralized hierarchy, to develop various autonomous parts of the network in conjunction with participating work groups. The basic philosophical approach advocated for foreigners is to use their influence and funding to encourage cooperation.

6.3.6 Benefits

1. Participants in subject and regional networks will benefit by increased access to ERIC.
2. The national search center will increase its clientele.
3. The CCERIC network could save thousands of dollars compared to other methods of accessing ERIC.
4. The information gained from ERIC could make a significant difference in Chinese education.
5. Both Chinese and Canadian researchers will gain valuable experience.
6. The research could lead to the development of marketable computer systems.
7. Concepts explored in relationship to CCERIC could lead to improvements in Canadian educational information systems.

As with any endeavour, one needs to look at the return on one's investment to gain the benefits mentioned above. The return on investment by Chinese participants is immediately apparent. The time and money spent will improve their information and education systems. One investment which is difficult to measure is the investment needed to bring about cooperation. Individual work units will lose some autonomy over their system and will need to expend time and effort to cooperate with other units. The Pilot Study would determine the investment needed and whether work units are willing to make this investment in order to benefit from participating in a cooperative network. Both China and Canada will have return on their investment from their research experience. For Canadian participants to gain a similar research experience without Chinese participation would be considerably more costly. The Researcher and his Chinese host have considered the research to be of significant value; therefore, they have invested their time and money to bring the research to this point.

6.3.7 Policies

The following statements regarding general policies are a summary of policy statements made by various Chinese leaders with whom the Researcher had contact or from presenters at the symposium attended by the Researcher. They are not to be taken as official policy. Specific policies stated below are statements made by the Researcher resulting from his study. These are stated as policies for discussion not as set policies to be followed.

General Policies

1. Popularization of computerized information retrieval needs to take place if maximum benefit is to be realized.

2. Systems need to be developed that process both Chinese and Roman characters, with an emphasis on Chinese information.

3. Until China's communications system is improved, centralized searching will be most economical.

4. Cooperation in developing union catalogs and maintaining standards is essential.

Specific Policies

5. Information centers should be networked together so as to obtain maximum national benefit.

6. Foreign funding should be used to conduct joint research and to encourage cooperation.

7. Computer systems should be compatible with each other and with existing systems.

The above policies provide a framework for the development of strategies for The Pilot Study.

6.3.8 Strategies

The strategies presented below are proposed for discussion in negotiating The Pilot Study Plan presented in this section.

It is proposed that:

1. Educational programs be set up at site A and B to encourage the popularization of Computerized Information Retrieval.

2. A system for processing ERIC records be developed so that Chinese classifications and comments can be added and records selected for printing and dissemination.

3. A national search center be set up at site G and regional search centers be set up at sites A and B.

4. Union catalogs and lists obtained from participants in CCERIC be developed into a comprehensive listing of all periodicals that are indexed in ERIC and available in China.

5. Regional CCERIC networks be developed, with sites A and B as coordination centers. These networks would cooperate with the national search center.

6. National CCERIC subject networks be developed, with site A being the coordination center for the Computer Based Education Network and site B the coordination center for the Educational Library Automation Network.

7. A joint research project be established with one Canadian and two Chinese conducting research in Canada and two Canadians and four Chinese conducting research at sites A and B in China.

8. Foreign funding be obtained for North American expenses and Chinese funding for Chinese expenses.

9. To encourage cooperation and participation in CCERIC: free searches be given to those who participate in regional networks and free primary documents to participants in subject networks.

10. Research into Chinese and North American computer systems be conducted so that systems can be developed which have maximum compatibility and functionality.

The above strategies are a starting point for the discussion and development of operational plans for The Pilot Study.

6.3.9 Operational Plans

Many of the strategies mentioned above could be implemented if personnel and cooperative agreements between various Chinese groups were in place. Since one of the ways of freeing up personnel and bringing various groups together is to obtain funding from North America for a joint research project, this is the focus of stage one of the operational plan for The Pilot Study. Stage two will focus on conducting further research both in China and Canada. Since strategies have not been agreed upon, operational plans, which are presented in Appendix E3, are theoretical plans. These plans could be a starting point for the development of actual plans.

6.3.10 Summary

The Pilot Study Plan for CCERIC is a plan to study the feasibility of implementing a network of information services to provide better access to educational information, especially the ERIC database in the People's Republic of China. The Pilot Study would be conducted jointly by Canadian and Chinese researchers both in China and Canada. Since the planning process is of primary concern in this thesis study, The Pilot Study Plan presented above is primarily used to illustrate this process, rather than presenting a fully developed plan which has been agreed upon by all who will be involved with the plan.

6.4 SUMMARY

In this chapter, the planning process, as outlined in The Researcher's Model (see Chapter Three), has been discussed in relationship to the development of a plan for implementing CCERIC (Chinese Computerized Educational Resources Information Centres). After presenting an overview of CCERIC, an analysis of an initial plan (The Preadoption Plan) is presented. This analysis is used to develop the Pilot Study Plan presented above.

One of the results of a Pilot Study would be a comprehensive plan for implementing CCERIC. It is also anticipated that The Pilot Study will demonstrate the benefit of a cooperative approach to implementing information systems in China. A model for using this approach is presented in the next chapter.

Chapter Seven

Conclusions

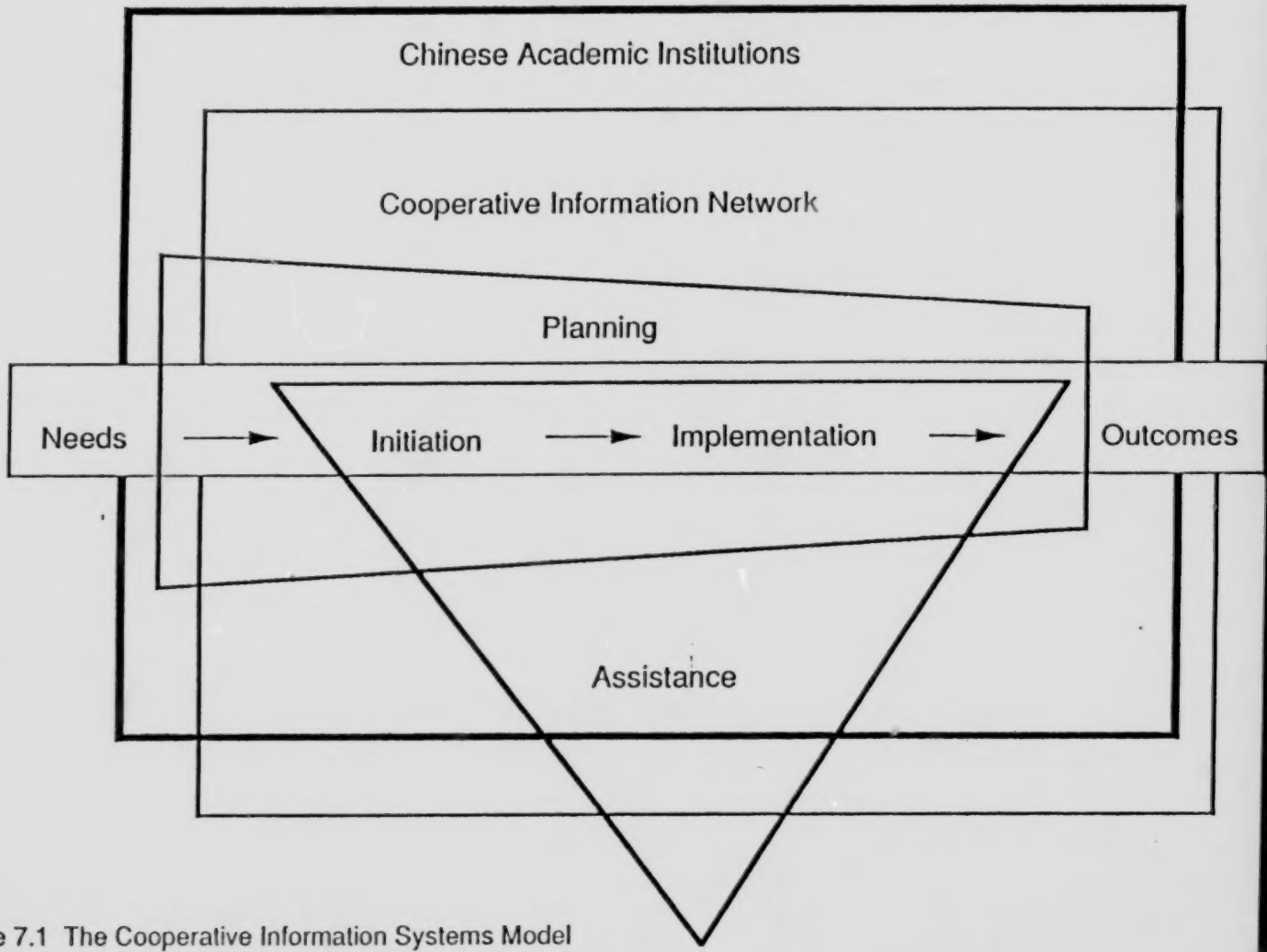
7.1 OVERVIEW

The first part of this chapter is a generalization of concepts developed in previous chapters of the Study and the second part is a summary of lessons learn through the Study. The generalization section of the chapter is presented through the development of a model for implementing cooperative information systems in Chinese academic institutions. This model is based on The Researcher's Model presented in Chapter Three, The Independent Research Project presented in Chapters Four and Five, and The Pilot Study Plan presented in Chapter Six.

The summary section of this chapter presents: recommendations for future research, a conclusion, and observations on the following topics; Naturalistic Approaches to Cross-Cultural Research, Conducting Social Science Research in China, and Using The Researcher's Model

7.2 THE COOPERATIVE INFORMATION SYSTEMS MODEL

The Cooperative Information Systems Model is a generalization of the CCERIC (Chinese Computerized Educational Resources Information Centers) concept presented in Chapter Six and The Researcher's Model presented in Chapter Three. Developing a general model for implementing cooperative information systems in China is valid for the following reasons: The Researcher's Model was developed as a general model for implementing educational innovations and The Independent Research Project explored the implementation of information systems in the broader Chinese context. The



gure 7.1 The Cooperative Information Systems Model

Cooperative Information Systems Model, which is represented diagrammatically by Figure 7.1, is presented below using factors identified by The Researcher's Model as an outline. First, factors related to the stages of The Innovation Process are discussed, followed by factors related to The Innovation, factors related to The Context and Assistance, and factors related to Planning.

7.2.1 Needs Analysis

Needs Analysis refers to the process of identifying, clarifying and prioritizing needs. The basis for the needs analysis presented below is the needs analyses conducted in The Independent Research Project and presented in The Pilot Study Plan.

1. Further research is needed into the implementation of cooperative information systems in Chinese academic institutions.
2. Cooperative Information Systems need to be able to process both Roman and Chinese Characters.
3. Information specialists and end users need experience with information systems so that they can evaluate their potential usefulness.
4. A centralized cooperative network needs to be developed so that resources and information can be shared.
5. Funding, especially Foreign Exchange Currency, is needed so that additional resources such as primary documents can be obtained.

With respect to further research, although an elaborate research project would be beneficial, what is more urgently needed is for units contemplating implementing information systems to consult with other Chinese institutions and to investigate international trends before selecting and implementing systems. The proposed pilot study would facilitate this type of consultation.

7.2.2 Initiation

Initiation refers to "those activities which precede the actual use of an innovation" (Burrows, 1980). The Initiation Stage of The Innovation Process can be divided into two stages "Preadoption" and "Preimplementation" (see Chapter Three). Since a cooperative information systems approach has not been adopted in China the Model presented in this section is a preadoption model. Implementation of The Pilot Study presented in Chapter Six would be a beginning step towards adoption of The Cooperative Information Systems Model.

7.2.3 Implementation

Implementation refers to the use of an innovation and all activities related to its use, prior to institutionalization. In The Preadoption Stage, current uses are examined in relation to potential implementation of an innovation. The "Access to North American Information" section of Chapter Five is an example of this type of examination. In The Preadoption Stage, the effect of implementation on specific Mental Understandings is considered in the context of Philosophical Issues which are presented below.

In China technical implementation is easy
a relatively short time. In contrast
to achieve and takes place over
years. For example
technically routine

potential end users consider Computerized Information Retrieval a very specialized method of accessing information and have had little or no experience using it.

7.2.4 Outcomes

Outcomes refer to the results of
measured when institutionalization
innovation has "become
1984). In The
to be

2. Cooperative networks will facilitate the exchange of information between individuals and organizations, which had not previously cooperated with each other.

Innovations

An innovation is "a deliberate, novel, specific change, which is thought to be more efficacious in accomplishing the goals of a system" (Miles, 1964, p. 14). In The Preadoption Stage, existing innovations are examined for relationship to priority needs and the specific context to determine which innovation has the best "Contextual Fit" or if a new innovation needs to be developed. As mentioned throughout this Study, the tendency for each work group to create its own system, without examining other systems, should be avoided. For example, The Pilot Study Plan mentioned in Chapter Six, proposes using existing systems in the initial network and further examination of other systems before selecting and/or developing final systems to be implemented.

The innovation proposed by The Cooperative Information Network is an innovative way of using existing systems in a cooperative manner. The following [illegible]

The Independent Research Project

the type of innovation [illegible]

was used to [illegible]

was given

placed in the departmental reading room for future use. Chinese annotations could have been added to the file before it was printed.

The above system is a cooperative system in that the CDROM system was in a different city and belonged to a totally different organizational structure than the end users of the information. The analysis of the information was not only for personal use but also for use by a group of users. Also, primary documents were sent from abroad through international cooperation.

Although the system described above is a very crude system compared to what is needed, it contains the basis elements of a Cooperative Information System:

1. A source of information (Dialog OnDisc ERIC).
2. A common format (MS-DOS textfiles).
3. A method for individual analysis and use of the information (use of a word processor).
4. The potential to add information to individual records or add new records.
5. The potential for group analysis and dissemination of selected records.
6. The sharing of resources in a network (facilitated by the researcher).

2.2.6 The Context and Assistance

The Context is anything that influences or is influenced by the implementation of an innovation. Assistance is any deliberate action or use of resources which aids the implementation of an innovation. Since in The Preadoption Stage specific assistance is not considered, topics

related to assistance are considered below in relationship to The Context. Technical problems and other physical conditions are treated in a similar manner, thus are not given special consideration at this stage.

In studying a context that is unfamiliar, a general overview, such as the one found in Chapter Two, is useful before studying a specific case, such as The Independent Research Project presented in Chapters Four and Five. In this section the general overview and the specific case are synthesized using The Researcher's Model as a guide.

The following topics have been identified as being the most important to implementing Cooperative Information Systems in Chinese academic institutions:

1. Philosophical Approaches
2. Cooperative Organizational Structures
3. Access to Resources
4. Motivation, Attitude, and Change

7.2.6.1 ***Philosophical Approaches***

The basic philosophical approach advocated in The Cooperative Information Systems Model is cooperation of several Chinese institutions in order to develop economical information systems. Although international cooperation, as described in The Pilot Study Plan, would facilitate this approach, it is not essential to it. In China, a cooperative philosophical approach needs to consider the governments need for central control, work unit autonomy and informal cooperation between individuals. Events in June, 1989, have reinstated centralized control as the dominant

philosophical approach in China. This means that cooperation with government policies is essential. The implementation of information systems in academic institutions supports government policies for modernization and economic reform. General support from the government can encourage work units to cooperate with each other. Each unit needs to have a specific function within a cooperative network and as much autonomy over their own systems as possible. With formal agreements for work units to cooperate, individuals can cooperate informally to improve the cooperative network. Since the goal of economical access to information is common to the government, work unit leaders, and individuals, it is believed that organizational structures can be developed to accommodate a cooperative philosophical approach.

7.2.6.2 *Cooperative Organizational Structures*

In order for the cooperative philosophical approach described above to be implemented, cooperative organizational structures need to be developed. As mentioned in Chapter Two, historically cooperative structures for Computerized Information Retrieval have been used. In Chapter Five the cooperative structure of the Chinese Academy of Science is also mentioned. Cooperation in this structure is based on the hierarchical structure of the academy. The cooperative structures proposed for The Cooperative Information Systems Model are based on information structures. One structure is based on the structure of foreign databases and another on Chinese societies that exchange information on a subject basis. Foreign bibliographic databases usually index a specific body of information (i.e. group of journals). For example, the ERIC database indexes information on Education. The structure proposed by The Cooperative Information

Systems Model would link together all institutions that need access to information indexed in a specific database. For example, The Pilot Study Plan presented above proposes that sites A, B and G (see Chapter five) be centers in a cooperative network for accessing the ERIC database. Site G would be a national search center since they have access to ERIC abstracts through their CDROM system. Sites A and B would be regional centers for accessing primary documents, since they are key institutions of education in their regions. Other institutions would cooperate with these sites.

The second type of structure proposed by The Cooperative Information Systems Model is an extension of cooperation which already exists in societies such as the Computer Based Education Society and the China Society for Scientific and Technical Information. The proposed cooperative structure would be organized according to subjects, such as Computerized Information Retrieval. Since members of the China Society for Scientific and Technical Information have the most experience in Computerized Information Retrieval, a cooperative structure (subject clearing house) could be organized through the society to provide better access to information on Computerized Information Retrieval. For example, since the ERIC database contains information on Computerized Information Retrieval, participants in the CCERIC network could analyze this information to determine its relevance to, and availability in China and pass the results on to the China Society for Scientific and Technical Information. The society would then organize this information using their information systems and disseminate it, in both computer and printed format. In addition to foreign information, subject groups would also process information originating in China. Once initial cooperative

agreements and information systems are set up, cooperation would generally take place through transfer of computer files. This structure allows for each institution to have autonomy over its own information systems, as well as benefit from cooperating with others so that a broader range of information can be accessed.

7.2.6.3 *Access to Resources*

The cooperative organizational structures described above are designed to provided shared access to a broad range of resources. Access to foreign information is the most difficult, since it requires FEC (Foreign Exchange Currency). For information indexed in foreign databases, access to abstracts needs to be considered separately from access to primary documents (see Chapter Five). Since access to abstracts is relatively easy, Chinese institutions are providing access to abstracts with little consideration for providing access to primary documents. For example, both sites A and G provide access to ERIC abstracts but neither has a system for obtaining primary documents. If other institutions such as site B follow a similar pattern and implement systems for accessing ERIC abstracts, then, on a national and regional basis, access to abstracts will far exceed demand, and access to primary documents will be far below the demand for them. The Cooperative Information Systems Model proposes that access to abstracts be centralized through national and regional centers and that the resources saved be used to obtain primary documents. The model also proposes that access to primary documents be organized on a national and regional basis, so that resources spent by individual institutions to obtain primary documents that are available in other

institutions, are redirected to obtaining primary documents that are not available in China or in a specific region.

In the Cooperative Information Systems Model, secondary access to foreign information and primary access to Chinese information would take place through a subject clearing house network. Searches of foreign databases would be analyzed and Chinese clarifications and comments added to selected records. These analyses would be sent to subject clearing houses, which would combine this information with domestic information to produce a new database, which would then be disseminated throughout China both in print and computer formats. Where applicable, copyright arrangements would need to be observed.

With respect to computerized access to information, most major institutions already have the computer hardware, and common software would be distributed to all participants in the network.

In order to develop and implement the information systems described above, additional personnel need to be allocated and trained. Additional personnel would be needed by clearing houses for the development and implementation of information systems. Once information systems are implemented, maintenance should require fewer personnel. Personnel could then be allocated to improving existing systems and developing new systems. Most user institutions would not need additional personnel, but their information specialists and end users would need training. In most cases existing personnel and training facilities are adequate for searching foreign databases.

7.2.6.4 *Motivation, Attitude, and Change*

During the development and implementation of information systems such as the ones described above, motivation and commitment to technical change are high. As mentioned earlier, technical change takes place in a short period of time in comparison with social change. In The Cooperative Information Systems Model, social change has been incorporated into technical change by advocating the design of technical systems based on an analysis of the context (social values, etc.). Wherever possible technical changes would be made to accommodate social norms, rather than expecting people to adjust to the technology. Motivation for adopting this model is economical access to information, which is believed to be consistent with the long term goals of Chinese society. These long term goals will produce continued motivation so that social change accompanies technical change. If social goals are not considered in selecting, developing, and implementing information systems, then they may be implemented technically but not socially. If this happens, these systems will be of limited use to China.

7.2.7 Planning

Planning is a process, which parallels The Innovation Process: in The Initiation Stage, plans are made for the adoption and implementation of an innovation, and in The Implementation Stage, these plans are continually revised until implementation is complete. Preadoption planning involves a consideration of all of the factors mentioned above, starting with needs analysis and ending with a plan to adopt a specific innovation to be implemented in a specific context.

The first step in planning is to develop a clear analysis of priority needs. The next step is to examine potential innovations and current practices to select an innovation or specify characteristics of an innovation which will best meet the needs identified within the context in which it is to be implemented. As a result of this examination existing relevant policies are identified and suggestions for modifications or new policies are made. Based on these policies, broad strategies for implementing the proposed innovation are developed. The need for additional resources should be outlined at this stage. Some initial operational plans may also be developed. The next step is to have the plan, outlined above, adopted by leadership and other influential people so that an implementation plan can be developed. In this plan, strategies are refined, operational plans are specified, and detailed plans for assistance made. Once implementation commences, progress is monitored and the plan modified accordingly.

The Cooperative Information Systems Model described above provides a basis for developing a preadoption plan for implementing Cooperative Information Systems in Chinese academic institutions. The Pilot Study Plan presented in Chapter Six is an example plan. The Pilot Study should be conducted before developing a comprehensive implementation plan.

7.2.8 Summary

The Cooperative Information Systems Model, which is based on the Researcher's Model (introduced in Chapter Three), emphasises cooperation of existing information services to utilize existing resources in the most cost effective manner. The proposed method of cooperation is to link Chinese academic institutions together using a network of computerized information systems to provide better access to both foreign and domestic information. The model focuses on social and cultural factors, which will have a major effect on implementing the proposed network.

7.3 SUMMARY OF LESSONS LEARNED

In this concluding section the lessons learned as a result of this Study are summarized using the following headings:

1. Observations on Naturalistic Approaches to Cross-Cultural Research
2. Observations on Conducting Social Science Research in China
3. Observations on Using The Researcher's Model
4. Conclusions on Implementing Cooperative Information Systems
5. Recommendations for Future Research
6. Conclusion

7.3.1 Observations on Naturalistic Approaches to Cross-Cultural Research

Using a general naturalistic approach, such as the one outlined in this Study, allowed for a more flexible research design and was less limiting, than if a specific approach had been adopted. In order to use a general approach effectively one should have a good understanding of the research

process and a general flexible plan that outlines several possible approaches to the research. It is also helpful to have a good understanding of the context before committing oneself to a specific research plan. A specific plan should give general direction to the research, allowing for modifications to the plan and the development of detailed plans as the research progresses. The method of theory sampling used in this Study was useful in data analysis, especially in developing typologies. The original typologies developed for Chapters Four and Five were too detailed and needed to be revised. An examination of these typologies prior to writing may have avoided a considerable amount of rewriting. The naturalistic approach used in this Study was well suited to conducting social science research in China.

7.3.2 Observations on Conducting Social Science Research in China

As mentioned by one of the Chinese research assistants, soft science (the term used by many Chinese for Social Science) research in China depends to a large extent on relationships. Many Chinese are interested in developing relationships with foreigners but are limited by restrictions placed on them by Chinese society. Since relationships are developed by being introduced to other people, a researcher needs to find ways of being introduced to potential participants in his or her research. Another concern of a Social Science researcher is developing appropriate means of gathering data.

One way of meeting potential participants in a research project is to give lectures related to the project. The Researcher has found the "Introduce Yourself Survey" to be a successful method for both developing

relationships and gathering data. First of all this approach allows the lecturer to develop a relationship with the group. Second, it allows timid participants to indicate their interest in developing a personal relationship with the lecturer. Third, it provides an atmosphere in which to interact with the lecturer during or after the lecture. Providing written questions in advance is useful, but not essential.

A note of caution must be added. If The Introduce Yourself Survey takes an excessive amount of time away from the lecture, it could destroy the lecturer's credibility. Before trying it, one should establish a relationship with the host of the lecture and ask for his/her advice on the feasibility of the approach. Do not ask for official permission, since that would put your host in an awkward position.

For groups larger than 10-15, having small groups of participants (see first lecture at site B, in appendix) collectively answer a few open-ended questions may be an alternative to The Introduce Yourself Survey. Another alternative may be to request voluntary written answers to open-ended questions. Taking a few minutes at the end of the lecture to explain the questions and assist in answering them is also useful.

Those who are interested in a research project and/or in developing a relationship with a researcher will sometimes approach the researcher after a lecture or will talk to the researcher's host to make arrangements to meet at a future date. Wherever possible a researcher needs to be open to accept these invitations and sensitive to what is being asked.

Two means of recording data were used in this Study: tape recording and typing information into a portable computer; both of which were suitable for different purposes. Typing information into the computer was the best means for general recording of data. It freed the Researcher from having to take extensive notes and it provided another participant observer ("the Research Assistant", see "Research Team" in Chapter Four). The novelty of the portable computer assisted in creating dialog at the beginning and end of lectures. Although permission to use a tape recorder was never refused, participants other than the research team seemed to be uncomfortable with its use. Although the tape recorded back up was seldom used, it had some merit, especially in cases where the type-written account omitted detail, such as the translation of Chinese conversations. A related technique was the verbal translation of Chinese materials, in which an interpreter verbally translated from Chinese to English and the Research Assistant typed the translation. The Researcher interacted with the interpreter if clarification was needed.

The specific methodologies described above need further refinement and use by others before they could become standard research practice. The principle of developing relational methodologies is applicable to a broad range of social science research in China.

7.3.3 Observations On Using The Researcher's Model

The Researcher's Model presented in this Study is designed to assist in planning and implementation of educational innovations. The basic value of the model is that it provides a typology of factors related to the

innovation process, which can be used as a checklist at various stages in that process (see Chapter Three):

1. In the *needs analysis* stage, the model could be used as a checklist for clarification and prioritization of needs.

2. In the *preadoption* stage, it could be used to compare various innovations to the context in order to select the innovation with the optimal contextual fit, with respect to meeting priority needs. If a suitable innovation does not exist, the model could then be used to specify characteristics of the innovation to be developed.

3. In the *preimplementation* stage, the model could be used to determine needed modifications to both the innovation and/or the context. The model could also be used as a guide for developing other aspects of a preimplementation plan.

4. In the *implementation* stage, the model could be used as a guide, especially in the area of "assistance", so that desired outcomes are obtained.

In this Study, The Researcher's Model was used as a checklist to identify topics for data analysis (Chapter Five), to develop a Pilot Study Plan (Chapter Six), and a Model for Implementing Cooperative Information Systems in Chinese Academic Institutions (Chapter Seven).

The Researcher's Model was used as a checklist in the following manner:

1. The introduction to the model presented in Chapter Three was used as a general checklist.

2. The other sections of Chapter Three were used to provide understanding of the general outline and to check for detail.

3. The checklist presented in Appendix A4 was also used to check detail, especially specific detail not mentioned in Chapter Three.

The Researcher's Model was very useful for the purposes of this Study and with further research and development could be useful as a general tool for planning the implementation of other educational innovations in other contexts.

Although The Researcher's Model is partially based on theory sampling of a specific group of studies, it is broader than these studies because it

is also based on the Researcher's experience through naturalistic generalization. Both theory sampling and naturalistic generalization have verified the generalizability of major components of the model. Since generalizability of specific factors related to the context and assistance are questionable, a more comprehensive review of the literature and further use of the model are needed before the model can be presented as a general model to be used in a variety of contexts. To allow users of the model to explore various viewpoints and in depth applications, a hypertext-like structure could be used. It is anticipated that further development of the model will not alter the basic framework but rather clarify the presentation of the model and broaden its applicability.

7.3.4 Conclusions on Implementing Cooperative Information Systems

Using The Researcher's Model as a guide, concluding statements about implementing cooperative information systems are presented in Table 7.1. A cooperative information system has been defined in Chapter One as "any system in which organizations and individuals cooperate to facilitate access to and dissemination of information by using computer systems". Statements in table 7.1 were developed by comparing The Researcher's Model (Chapter Three), with The Cooperative Information Systems Model (Chapter Seven), and The CCERIC (Chinese Computerized Educational Resources Centers) innovation (Chapter Six).

Table 7.1
Summary of Conclusions on
Implementing Cooperative Information Systems

Needs

1. Current information systems could meet the need for ERIC abstracts (see section 5.2.2.2).

2. Part of the need for primary documents indexed in ERIC could be met through an inter-library loan system.

3. Additional FEC (Foreign Exchange Currency) is needed to meet the total need for primary documents (see section 5.2.3).

4. New cooperative structures need to be set up so that resources can be shared (see section 7.2.6).

Initiation

1. A decision to adopt CCERIC by either site G or site A and one other site could initiate the CCERIC Pilot Study.

2. The CCERIC Pilot Study Plan should be modified and approved by leadership and major participants before being implemented.

Implementation

1. Each work unit would have a clearly defined role in implementing its part of the overall network.

2. Developing informal relationships among participants will facilitate implementation.

3. The cooperative use of existing resources is essential to implementing CCERIC.

Anticipated Outcomes

1. Everyone who participates in CCERIC will have access to ERIC abstracts.

2. If a primary document is available in the CCERIC network it can be obtained by those who need it.

3. Selected ERIC records will be incorporated with domestic records to produce a Chinese Educational database.

4. A broader network of databases will be developed using CCERIC as a model.

The Innovation

Although current information systems could be used in the initial stages of The CCERIC Pilot Study, a more sophisticated system needs to be developed with the following characteristics:

1. A means of processing both Chinese and English language information.

2. An efficient method for selecting and manipulating new information.

3. A means of obtaining primary documents.

4. A means of identifying information for selected dissemination.

5. A means of adding information to the system.

6. A means of synthesizing information on a specific article or topic.

7. A means of translating selected English language information.

The Context

1. The exchange of information on floppy disks will be facilitated by the postal service.

2. The physical location and public availability of computing systems may hinder the implementation of CCERIC.

3. The economic benefit gained by sharing resources is consistent with the philosophy of both the state and potential participants in CCERIC.

4. Since the cooperative philosophy of CCERIC is inconsistent with developing strong independent work units which exercise control over their resources, formal networking will take considerable energy and negotiations.

5. Sufficient administrative latitude must be given for autonomous groups to develop their own systems but not so much that networking with other groups is hindered.

6. If people have a relationship informal networking is easy to attain.

7. The researcher will need to use his influence to initiate The CCERIC Pilot Study.

8. If CCERIC is to be widely disseminated, influential people in the State Education Commission need to be persuaded that it can be incorporated into current initiatives to provide automated access to Chinese information.

9. Leaders and facilitators will be motivated by the status of having a modern information system and obtaining foreign funding, if it is available.

10. End users of CCERIC will be motivated by improved access to information.

11. CCERIC will be implemented in a manner which will minimize social change by modifying or developing computer systems which accommodate existing social systems.

Assistance

1. Since CCERIC involves both technical and social implementation, monitoring and assistance will need to take place over a several-year period for maximum social benefit to be realized.

2. Assistance in resource acquisition and utilization can be obtained from the CCERIC system.

3. Operators of current information systems would need some additional training to implement CCERIC.

4. Most other information specialists and end users would need to be trained in the use of abstracts, Computerized Information Retrieval, and CCERIC systems.

Planning

1. Although not formally stated, existing policies support CCERIC.

2. Strategies for CCERIC emphasize social over technical implementation.

3. Although comprehensive operational plans for CCERIC will be developed over time, some initial plans for a pilot study can be implemented immediately.

Statements in table 7.1 are generalizable to The Independent Research Project (Chapter Four) and the CCERIC innovation. Generalizability to other Chinese contexts, other Less-Developed Countries, and North America are dependent on whether a similar statement could be made with respect to implementing cooperative information systems in these contexts. Since The Researcher's Model and The Cooperative Information Systems Model are general models, and The CCERIC innovation was developed from the general

Guiding Principles presented in Chapter One (section 1.3) it is anticipated that the conclusions presented in table 7.1 will be generalizable to other contexts. Implementation of The CCERIC Pilot Study will verify the accuracy and generalizability of these conclusions.

7.3.5 Recommendations for Future Research

The research conducted in conjunction with this Study has led to the development of a Model for Implementing Information Systems in Chinese Academic Institutions. The basis of this model has been The Researcher's Model presented in Chapter Three and use of that model in developing The Pilot Study Plan presented in Chapter Six. In the process of conducting research related to this Study, a methodology for gathering data by utilizing opportunities to develop relationships and encourage dialogue within the confines of academic life in China was developed. Based on this research it is recommended that:

1. The Researcher's Model be further developed by:

    a. comparing it with other models and guides for implementing innovations.

    b. using it in other contexts.

    c. developing an expanded set of checklists similar to Appendix A4, with hypertext-like references to a variety of sources.

2. The CCERIC Pilot Study Plan be modified and implemented by a joint China - Canada research agreement.

3. The Cooperative Information Systems Model be further developed and used to implement cooperative information systems in China and other contexts.

    a. For example, a system is being developed to facilitate students and their instructor in cooperatively analyzing information related to a course of study.

    b. Another example is a system being designed to facilitate the cooperation of international organizations and individuals in collecting,

analyzing, and disseminating information on topics of common interest.

c. Tables 5.1 and 7.1 could be used as a basis for a survey of international students to determine the generalizability and accuracy of the statements presented in the tables.

4. Naturalistic methodologies used in this Study be further developed by:

   a. comparison with methodologies used by others.

   b. obtaining feed back on the use of methods like "The Introduce Yourself Survey" by others.

   c. using these methodologies in other contexts.

China is a good place to conduct research on implementing North American innovations in LDCs (less-developed countries) for the following reasons:

1. Technical implementation in China often approaches and sometimes surpasses technical implementation in North America.
2. Social implementation is similar to implementation in other LDCs.
3. The technical infrastructure is sufficiently developed to facilitate the research.
4. The research environment is similar to other LDCs.
5. Qualified personnel are available to assist in the research.
6. The cost of conducting the research is lower than in North America.

An outline for continuing research into the implementation of cooperative information systems is presented below:

1. Develop a North American Prototype Cooperative Information System.
2. Visit China to present research findings and to discuss further cooperation.
3. Establish independent research projects, with informal cooperation between them.
4. Establish a formal China - Canada research agreement.

5. Implement the CCERIC Pilot Study.
6. Implement a CCDOS version of the North American Prototype System.
7. Develop a comprehensive plan for a national Chinese Cooperative Information Network.

The development of a North American prototype system is already being done on a small scale and funding proposals for further research have been developed. If a means can be found to facilitate on-going research and the dissemination of the research results to other LDCs, the potential impact of research done in China is great.

7.3.5 Conclusion

In this Study, the problem of accessing North American information in China has been introduced (Chapter One), the Chinese context has been described (Chapter Two), a model for implementing innovations developed (Chapter Three), the methodology used and the results of an Independent Research Project were presented (Chapters Four and Five), a plan for a Pilot Study into the implementation of a network to access the ERIC database was developed and evaluated (Chapter Six), and a Model for Implementing Cooperative Information Systems in Chinese Academic Institutions was developed (Chapter Seven).

The Researcher's Model presented in Chapter Three and used as a guide for presentation and discussion of results in Chapters Five, Six, and Seven is a viable model to assist in planning the implementation of information systems in China. Methodologies developed in conjunction with The Independent Research Project, mentioned in Chapter Four, are useful in gathering data in the context of the Chinese academic community.

Although The Researcher's Model, The Cooperative Information Systems Model and the CCERIC (Chinese Computerized Educational Resources Information Centers) concepts need further development, sufficient evidence has been presented in This study to indicate the value of these concepts to improve the planning process for implementing information systems in Chinese academic institutions.

At the present time, funding for educational innovations is a low priority both in Canada and China. One begins to wonder if the priority placed on immediate economic and technical concerns is wise in relation to the long term development of educational systems which not only provide for future economic development but, more importantly, the development of human beings who, through access to information, need to learn how to wisely use and develop the economic and technical systems being created.

Since educators need to operate within the priorities set for them by society, they often find creative ways of extending existing funding to reach priority goals such as developing informed people. If The Cooperative Information Systems Model is used to implement information systems in Chinese academic institutions, it is anticipated that existing funding could be used to produce a better informed society. The benefit of using this model could be demonstrated by the proposed Pilot Study, which could be conducted with very little additional funding.

A cooperative agreement between the Researcher and his host department has produced this Study. Whether this cooperation can be extended to a pilot study, and to the implementation of cooperative information systems in Chinese academic institutions remains to be seen.

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Appendix A
Background Information

A.1 Statements Made by IDRC

As published in a brochure on Program Directions by the Information Sciences Division of IDRC (International Development Research Center), Ottawa Canada. September, 1985.

1. That the volume of scientific literature is so enormous that no country, certainly no developing country, has the resources to build an independent and comprehensive national information system. Hence, any attempt to address the needs of the developing countries must be based upon cooperation.

2. That, for any country, the most important information is that which has been generated within the country. The production of information reflects the investments that a country has made in research and other studies.

3. That, to escape the condition of dependency, a developing country needs to have the skills to reach out into the rest of the world to acquire those pieces of information that it has identified as important to its development process; it cannot rely on foreign sources to make the selections on its behalf.

4. That the existing unconnected proliferation of libraries and documentation centres results in much duplication of effort, and that interconnection and cooperation can lead to a more rational use of resources and the avoidance of waste. (p. 3)

A.2 Problems related to Educational Information Systems and Services

The following problems are excerpts from a report on "Educational Information: Problems and Issues, and Strategies for Resolving Them. Report of a Regional Workshop (Tokyo, Japan, February 1-23, 1983" published by: National Institute for Educational Research, Tokyo Japan; United Nations Educational, Scientific, and Cultural Organization, Bangkok Thailand. November, 1983.

Note that the original numbering system is used so that the reader can find the problem along with suggested solutions/strategies in the original document.

1.1 Lack of co-ordination among various government agencies and educational institutions resulting in unnecessary duplication of efforts, incomplete coverage, lack of standardization, problems of inconsistency, incompatibility, and accessibility of educational information.

1.2 Inadequate attention to setting up of an integrated national network(s) for educational information.

2.1 Lack of systematic planning in the acquisition and dissemination of educational documents.

2.2 Inadequate processing of educational literature (abstracts, reviews, etc.) to meet the needs of different groups of users.

2.4 Lack of awareness of existing educational information sources.

3.1 Shortage of funds for establishing and operating sound educational information systems and services.

4.1 In accessibility of educational information written in other languages owing to the lack of translated materials.

5.1 Lack of comprehensive educational information systems and services in different levels of education, geographical areas and sectors of national activity.

5.2 Non-availability of relevant educational information when needed for decision making, planning etc. and obsolescence of educational data for research and other purposes.

5.4 Lack of standardization of educational and technical terms and bibliographical forms resulting in inconsistency within and between educational information systems.

6.1 Negative attitudes towards use of computers in educational information systems by some operatives, users and contributors and too much expectation on computers to do more than what is possible.

6.4 Difficulty in deciding on the correct choice of hardware and system configuration (centralized or distributed processing) owing to the rapid advancement of computer technology.

6.5 Lack of awareness among users of the importance of active participation in the development of computer systems.

6.6 Non-availability of suitable software for specific needs.

6.7 Difficulty of developing a computer system due to the processing being time-consuming and expensive.

A.3 A Brief Historical Comparison of Chinese and Western Modernization

Fairbanks (1986), in the introductory chapter of his book entitled "The Great Chinese Revolution 1800 - 1985", compares China to the United States of America. The following excerpts from this comparison are intended to provide western readers with a brief overview of China's past with respect to modernization. It may also be useful for Chinese readers to gain a better understanding of their past as they face modernization.

> The cultivatable land area is only about half what we have, yet the population is four times as large. [Therefore],China's poverty per capita is a first big difference. The second difference is more subtle - China's continuity in the same place. The Atlantic civilization of Western Europe and the Americas has seen its political-cultural center move westward from Athens to Rome, then to Madrid, Paris, London, and New York. The corresponding movement in China has been only a few hundred miles, from Sian near the lower bend of the Yellow River south to Hangchow-Nanking, and north to Peking (p. 2).
>
> A third difference handicaps them, for they have been obliged to modernize from within their own cultural tradition, which resists change. The new technology of transport, industry, and communications has been native grown in the West but a foreign import into China (p. 3).
>
> While European nations were exploding [by establishing colonies and empires], the Chinese people were imploded by filling up their beautiful country with a dense population (p. 5). The result of China's implosion, in short, was a remarkable integration of state, society, and culture. The Western type of pluralism had less chance to emerge in China. (p. 6).
>
> Two major differences resulted from this situation. The first was that the ancient Chinese empire had to inaugurate the functions of bureaucratic government... Bureaucracy permitted centralized rule but required the training of an elite to be officials (p. 6)... [Another function of bureaucratic government was] to have the population control itself through "Legalist" systems of mutual responsibility and therefore mutual surveillance. A second result of China's implosion was the early flowering of the arts and technology of civilization. The agrarian-bureaucratic society recruited from the whole talent pool an elite, who became chroniclers, artists, connoisseurs, philosophers, and functionaries... The result was that China achieved a cultural superiority over all other East Asian regions, the after-effects of which have lasted to this day. A sense of cultural superiority is inbred in the Chinese people. This of course has made it all the harder for them to suffer the humiliations of backwardness in modern times... To modernize, in short, China has had farther to go and more changes to make than most countries, simply because it has been itself for so long (p. 7).

A.4 The Researcher's Checklist

The Researcher's Checklist is a list of points which was used as a checklist to see if important points had been overlooked in the planning process. Some of the point were taken from Chapter Three and others are additional points from the studies used in developing The Researcher's Model. Since this Checklist was developed for The Researcher's personal use, editorial liberty has been taken so as to present an itemized list.

In this appendix a sample excerpt from Chapter Three is presented along with additional excerpts from other studies.

Sample Excerpt from Chapter Three: (Havelock and Huberman, 1977)

Note this is not a complete quote (For the complete quote see Chapter Three).

1. As a *sequence of events* over time

2. A set of *people and institutions* who are tied together

3. A *problem-solving sequence*

4. *A temporary* system

   (a) composed of many integrated elements
   (b) recognizable input, throughput and output subprocesses
   (c) composed of people and institutions
   (d) a system of functions and actions (p. 34)

The points listed below are excerpts which are not found in Chapter Three.

Influence of an outside expert: (Havelock and Huberman, 1977)

1. He can present proposals on behalf of people who cannot get access to these officials.

2. The outside expert can also say publicly what others think privately.

3. The outside expert can also help to find other external resources which will permit solutions that would otherwise have been rejected. (p. 129-130)

Profile of "outside experts" which have a positive influence: (Havelock and Huberman, 1977) [Note underlining added]

1. He is able to <u>work co-operatively</u> with national counterparts; it is clear that a great deal of the outsider's success rests on good interpersonal relations, and on skills relating to people on a one-to-one and one-to-small group basis.

2. He works hard to transfer his skills to his national counterparts. Most outside experts realize in principle that they must do this, but it can be difficult both technically and psychologically (in that the expert must demystify his expertise and lose some of his special power in the process).

3. He must adapt whatever knowledge and skills he has to the particular situation [sic] in the process he may find that most of his specialized knowledge is useless; the real need may be in areas outside his competence, thus forcing him to don the mantle of generalized, mystical 'expert' or to resign in favour of some other. He may also find that his skills as an experienced observer and consultant to projects in general, i.e. his knowledge of the process of change, is far more relevant and useful than his special knowledge of the content area.

4. Finally, the effective outside expert must be able to bring to the situation skills and knowledge which are both relevant and unique, i.e. not possessed by the locals already, and not available from the home government. (p. 185-186)

Problems associated with early influence of outside experts: (Havelock and Huberman, 1977)

5. By 'early involvement', we mean that outside experts are present, and sometimes dominant, before a final solution is devised: that is to say, at the need-processing and problem-definition stages. The first danger of early external involvement is that of *overlapping but not identical* objectives. The bilateral or international agencies are particularly interested in *identifying* and *experimenting* with models of foreign-assisted projects which can be applied in various countries without requiring massive local adaptation.

6. *Inappropriate or impractical solutions*. The danger of a model is that it seldom applies to any one specific situation.

7. *Deviation from initial objectives*. These are often cases where the solutions envisaged by national officials are incompatible with the type of projects which external agencies are prepared to support.

8. *Risk of subsequent disinterest*. Much empirical research and a little common sense tell us that when others invent solutions for our problems a number of things are likely to happen. First, we find out that our problem is not exactly the one to which the solution addresses itself. Next, we do not take full responsibility for solving our own problems; and, finally, the other person is tempted to involve himself in solving the problem for us, which in turn, contributes to the first and second outcomes. In short, when others invent solutions, we are less *committed* to the implementation phase.

9. *Neglect or discrediting of internal resources*. Early outside intervention, with the promise of additional aid, encourages national officials to concentrate on solutions which depend on

resources lying outside the country before internal resources have been exhausted.

10. *Conflicts*. There is a tendency, when significant external assistance enters at an early phase, for these experts to make a subtle appropriation of, or identification with, the project. p. 130-134)

Transfer of responsibility to nationals: (Havelock and Huberman, 1977)

11. Some of the conditions associated with good transfer of responsibility are

    (a) provision for support during the adoption phase,
    (b) gradual increase of practice and responsibility during the life of the project and
    (c) development of self-confidence and commitment to the innovation through a demystification of the 'expert-specialist' role." (p. 19).

Achieving Autonomy (Havelock and Huberman, 1977)

1. *Planning and providing for follow-up* [italics added]. Where communities, institutions or ministries have made provision for the period when external support will be absent or drastically reduced, there is evidence of successful implementation of the innovation.

2. *Gradual preparation*. The new skills, behaviours or structures must be tried out and exercised so that the moment of independence is not overly brutal.

3. *Confidence or commitment*. There must be confidence that the person or institution will be able to function successfully without undue dependence on external aid. This will also increase the commitment to the changes being made. (p. 278, 280)

Community influence: (Havelock and Huberman, 1977)

Over 95 percent of respondents indicated there was some form of involvement by the community, usually at the level of working teams, but sometimes at all levels. This finding highlights the importance of media use as an attempt to

(a) make the community aware of educational needs,
(b) make the community aware of educational innovations relevant to those needs,
(c) arouse their interest in these matters and
(d) give them a vicarious sense of participation in the problem-solving and decision-making process." (p. 16)

Types of assistance: (Huberman and Miles, 1984)

1. CON (Control): The assister was exerting pressure aimed at making the receiver do something.

2. TTR (Teaching/training): The assister was explicitly transmitting information, developing receiver skill, and so on, usually in a structured way.

3. SOL (Solution giving): The assister was giving the receiver "answers,", advice, solutions to problems.

4. RES (Resource adding): The assister was providing materials, money, time, or other resources needed by the receiver.

5. ADV (Advocacy): The assister was actively representing the interest of the receiver to some other audience (such as administrators or funders).

6. FAC (Facilitation): The assister was aiding the receiver to achieve goals, giving at-the-elbow assistance with the processes being used.

7. INQ (Inquiring): The assister was collecting data from the receiver, or from the implementation situation more generally, and feeding it back in a "formative evaluation" to aid in the next steps.

8. SUP (Support): The assister was providing encouragement, reinforcement, or emotional support to the receiver. (p. 102)

Strategic Types: (Fullan et al., 1988)

1. Competence development (enlarging and developing skills of teachers and administrators through training).

2. Consultant development (identifying local facilitators, enhancing their skills, and building a support structure for them).

3. Stimulation/facilitation of naturalistic efforts (supporting grass roots initiatives at the board/building level, including experiments, pilots, demonstrations).

4. Diffusing and supporting effective practice (disseminating well-developed practices and supporting users in implementation of them).

5. Networking (linking users within and across school and boards for mutual enhancement).

6. Organizational capacity-building (strengthening the ability of boards and schools to manage the multiple innovations involved in the change process; developing a good infrastructure of supporting agencies). (p. 5.6-7)

Criteria for a Good Strategy: (Fullan et al., 1988)

1. Local responsiveness

2. Indeterminate initial target

3. Increasing target clarity

4. Learning maximization
5. Credibility high
6. Demandingness reduction
7. Intense, sustained, responsive assistance
8. Expanded assistance capability
9. Support for user interaction
10. Clarity re principal role
11. Attention to time re-allocation
12. Early success likely
13. Use of existing human resources
14. Accommodation of old and new
15. Acceptance of software imperfection
16. Accommodate changing range of user types
17. Iterative, development
18. Coordinate multiple Agencies
19. Provision for parent involvement and support (p. 5.34)
20. Visible progress and impact (p. 4.8)

Six Types of Strategies: (Havelock and Huberman, 1977)

1. Locally participative and responsive problem-solving and self-help strategies
2. Power, authority, administrative, and legalistic strategies
3. Strategies emphasizing openness, flexibility, eclecticism
4. Strategies emphasizing communication and diffusion of innovations through various channels and interpersonal networks
5. Systematic research-oriented and evaluation-controlled approaches
6. Approaches which emphasized inside-outside co-operation, and dialogue (p. 244)

An Optimal Strategy for System Changing and Innovation: (Havelock and Huberman, 1977)

1. It is well-*connected* to the system which it is attempting to improve, having effective connexions [sic] and relationships with key persons and opinion leaders in all relevant subsystems.

2. Persons involved in the innovation subsystem work together as a *cohesive* team with a shared high sense of interdependence and committment [sic] to project objectives.

3. It is oriented to serving the real and self-perceived *needs* of the system it is trying to change (the 'host' system).

4. It is *open* to recycling and to trying to improve its own procedural configurations for problem solving.

5. It engages in continuing and active *dialogue* with the host system regarding through-put and output, with a view toward the subsequent acceptance, integration, maintenance, and diffusion of the innovation within the host system.

6. It works to improve the problem solving configurations, leadership and structures of the host system.

7. It tries to help the host system move toward higher levels of development as defined by the host system. (p. 69)

Appendix B
Questionnaires

B.1 Questions Used for Small Groups and Interviews

General Individual Questions:

- What type of work do you do?

- How do you use English language information in your work?

- How do you get the English language information you need?

General Small Group Questions:

- What is the function of your institution?

- What are China's needs in terms of accessing information in foreign databases?

- Do you use printed indexes or abstract journals?

- How do you get original documents?

Questions for End Users:

- Is this the first time you have heard about computer searching?

- Have you ever done a computer search?

- Have you heard about ERIC before?

- Have you heard about Current Index to Journals in Education (CIJE) before?

- Have you heard about Resources In Education (RIE)before?

Question for Information Specialists:

- How are the following methods of accessing these databases used in China: online searching, batch searching of magnetic tapes, and searching of CDROM disks?

- If your institution uses the ERIC database or other ERIC services, such as the ERIC thesaurus or abstract journals - Current Index to Journals in Education (CIJE), or Resources In Education (RIE); when did you start this service, who has access to these services and where are these services located? (ERIC registration form, approximate number of users per month,

- If your institution uses computer programs for processing information, what programs do you use and how do you use them? Databases, library automation etc..

Since my questions cover a broad range of topics related to information processing systems, you will probably not have

answers to all of them. If you know of someone who could answer some of these questions, I would appreciate getting in contact with this person.

B.2 The Faculty Invitation Survey

If you need English Language Information you are sincerely invited to attend four lectures on Educational Information Processing Systems. Topics for the lectures are as follows:

-Current Information Processing Practices.
-Meeting Your Information Needs.
-Requesting and Analyzing a Computer Search.
-Using a Computer to Process Your Information.

Lectures start: Friday, November 6th, from 10:00 am to 11:00 am

---

If you are interested in attending the lecture series, circle #1 one below. If you are not interested, please circle the response which applies to you. Please return this part of the form to the Librarian's mail box by October 31st.

Name:

1. I wish to attend the lecture series.
2. I am interested in computer searching but I can not attend the lecture series.
3. I do not need computer searching because I have enough English language information.
4. I only need Chinese information not English.
5. Other _____.

Comments:

We would like everyone to answer these questions in either Chinese or English and return them by October 31st. If you have any questions about our project you can contact The Coordinator.

B.3 Educational Information Processing Systems Seminar Questionnaire
by David Ibsen

If you need more space to answer a question place the number of the question and your answer on a separated sheet of paper.

1.I am:

___ An Academic Staff from Inst. of Mod. Ed. Tech.
___ An Academic Staff from _____.
___ An Administrative Staff.
___ A Junior Student.
___ A Senior Student.
___ A Graduate Student.
___ A Librarian.
___ Other _____.

Please answer the following questions in relationship to English Language information used for your work.

2.List the subjects for which you need English language information. Circle a number to show how important the information is to you. Circle 1 for subjects of some importance, 2 for average importance and 3 for very important.

Importance	Subject
1 2 3	_____
1 2 3	_____
1 2 3	_____

3.Circle a number in front of the following sources of English language information to show how often (frequently) you use them. 0 shows no use, 1 shows that you use it sometimes, 2 that you use it often and 3 that you use it very often, Circle a number behind the source to show how useful the information is to you. 0 for no use, 1 for some of it is useful, 2 for average usefulness, and 3 for very useful.

Frequency	Source	Usefulness
0 1 2 3	Radio, Television or Movies	0 1 2 3
0 1 2 3	Journals or Magazines	0 1 2 3
0 1 2 3	Research Papers	0 1 2 3
0 1 2 3	Conferences	0 1 2 3
0 1 2 3	Lectures	0 1 2 3
0 1 2 3	Books	0 1 2 3
0 1 2 3	_____	0 1 2 3
0 1 2 3	_____	0 1 2 3

4.List the English language journals which you get information from. Circle a number in front of each journal to show frequency of use and behind the journal to show usefulness.

Frequency	Journal	Usefulness
0 1 2 3	_____	0 1 2 3
0 1 2 3	_____	0 1 2 3
0 1 2 3	_____	0 1 2 3

Appendix C
Additional Information on The Methodology

C.1 Major Participants in The Independent Research Project

Similar to members of the research team (see Chapter Four), major participants have been given designated titles which are used for reference. Designations correspond to the site (A, B, etc) to which participants belong, where more than one participant has the same designation at the same site, numbers are added to the designation i.e. "Experts G1 and G2".

The first group of participants are designated as experts because of their information science or other expertise.

1. *Expert A* was the head of the computer group of the library and information science department at site A.
2. *Expert B* was the head of the computer group of the main library at site B.
3. *Experts C, D1, D2 and E* were leaders in the China Society for Scientific and Technical Information and participants in interviews conducted at their respective sites.
4. *Expert F* was the head of the host department for the lecture series presented at site F.
5. *Experts G1 and G2* were interviewed at site G. Expert G1 was the head of the library automation department and Expert G2 a staff member of the department.

Other participants have various designations, which are as follows:

1. *Faculty Participants A1 and A2* were members of the faculty of the host department for the independent research project. They participated in interviews at site A.
2. *Biology Specialist A* was so designated because he belongs to the biology department at site A.
3. *Information Specialist A* belongs to the scientific information retrieval group at site A.
4. *Information Specialist G* was responsible for CDROM computer searching at site G.

C.2 Administration Seminars and Meetings

The formation of The Administration Group was the result of the two introductory negotiation meetings mentioned below and individual discussions with research assistants, who were assigned to the project by the host department. Most of the seminars were attended by The Research Assistant (Canadian) and two Chinese research assistants (The Secretary and The Coordinator, see Research Team in Chapter Four). Other Chinese assistants attended some of the seminars. Occasionally meetings were arranged with the supervisor and advisors and research assistants. Individual meetings with participants were also held.

One of the purposes of the administration seminars was to teach the Chinese research assistants principles related to the administration of a research project. Other purposes and activities are discussed below using the following headings: Negotiations and Making Arrangements.

Negotiations

From the time The Researcher first contacted the host department until he left China, he was involved in negotiations of some sort. The Researcher considered negotiations by letter prior to arriving in China as preliminary, where as the host university considered them to be more contractual. As mentioned in Chapter Two, this is a new trend in Chinese foreign policy. The morning after The Researcher arrived a meeting was scheduled to discuss the research and to go over expectations (also referred to in Chapter Two). At this meeting The Researcher mentioned that he would like to have people from the library group involved in the research, thus a second meeting was scheduled to discuss the research project with these people in attendance. Both these meetings were attended by The Researcher's Supervisor, advisors and research assistants. The second meeting was also attended by a representative from the library group and others from the host unit who were interested in the project. Negotiations with respect to the research centred around The Researcher's status more than the content of the research project. To resolve these problems, the research project was reorganized to use lectures and seminars as a means of conducting the research.

Negotiations regarding status centred around different interpretations of The Researcher's status. The Researcher had originally requested to be a visiting scholar with respect to his research and a foreign lecturer with respect to his teaching. Lectures were to be given in exchange for housing. The host department initially agreed to this arrangement, subject to administrative approval. What the department and The Researcher did not realize was that special arrangements like this were being replaced by more formal arrangements according to government policies (see Chapter Two). As a result the department and The Researcher came to a tentative agreement for The Researcher to initially pay for his own housing until a more suitable arrangement could be made. The department obtained foreign lecturer status for The Researcher but the university considered The Researcher to be a foreign researcher and thus charged for the housing. When The Researcher arrived he tried to negotiate visiting scholar status without having to pay fees, since he was working on a joint research project and not attending classes. The Researcher and the department soon came to a common understanding of the problem but were unable to persuade the administration. At one point in the negotiations the academic side of the university had approved a suitable compromise but this was overruled by the financial affairs office. The basic problem was that the department did not qualify to receive funding for a foreign lecturer. The final status of The Researcher was a foreign lecturer, who received chinese wages and paid foreign researcher prices for his housing and foreign student prices for his food. This status allowed The Researcher to experience all aspects of foreign status and much more freedom than if he had had a more specific status. Negotiations were also involved in making the arrangements described below.

Making Arrangements

Almost all arrangements for The Researcher's stay in China needed to be made by his host. This not only included housing and food as mentioned above but also travel and entertainment on special occasions. Arrangements of an academic nature included arranging lectures and

seminars, the use of computer equipment, visits to other departments, and the importing of a CDROM player. Importing the CDROM player was a long involved process taking over a year to complete. Prior to arriving in China The Researcher had offered to assist in importing the player. The department made arrangements to have the player imported but notification of their intent arrived after The Researcher had left for China. If The Researcher had brought the player with him, this would have been the simplest solution. Importing the player after The Researcher had arrived involved getting approval all over again from the various offices, the equipment office and the financial office at the university, the customs office and other government offices. Although The Researcher heard of this process through a research assistant, he gained enough understanding to realize the complexity and levels of control involved. The problems did not end on the Chinese side, communications with the supplier and export arrangements and financing all presented obstacles to making arrangements for the player to be sent to China.

C.3 Coordination Seminars and Meetings

The Coordination group was formed as a result of a need to separate administrative activities from research activities. The Coordinator of the project was appointed by the project supervisor upon recommendation of The Researcher. Another research assistant from the host department (The Librarian) was invited to join the group. These two people along with The Research Assistant (Canadian) attended most of the seminars of the group. Meetings with individual members of the group also took place, most frequently with The Coordinator. The original intent of this group was to coordinate the participation of research assistants from various library groups. Potential assistants from two library groups attended initial seminars of the group but did not get senior leadership approval to continue formal participation. One group informally participated in the project until completion but was unable to attend seminars and meetings due to time pressures.

Most research activities were discussed with this group before they were tried with participants. Modifications were made and plans for implementation of the activity developed. One of these activities involved the development of survey's and questionnaires. An open-ended questionnaire was administered to the research assistants to get feedback so that a rank order questionnaire could be developed. The open-ended questionnaire was received positively but research assistants were uncomfortable with the rank order questionnaire. Although various modifications were made to the questionnaire to make it workable, it did not yield the desired results because it was foreign to the audience. From this experience The Researcher began to learn when to modify an innovation to suit the context and when to select another innovation more suited to the context.

Another area of research discussed with this group centred around explorations of the potential usefulness of ERIC in China. These explorations contributed substantially to the development of the CCERIC (Chinese Computerized Educational Resource Information Centers) concept.

Plans for the research to continue after The Researcher had returned to Canada were also discussed with this group. Plans were twofold: what could be done without further funding and what type of funding arrangements could be made to continue the research.

C.3 Faculty Seminars

In addition to the main participants in the coordination group mentioned above (The Researcher, The Research Assistant, The Coordinator, and The Librarian), two participants from the lecture series were invited to form The Faculty Seminar Group. One of these participants was from the Biology department (Biology Specialist A) and the other from the Scientific Information Retrieval group (information specialist A). Both of these participants indicated a keen interest in the research and desire to develop a relationship with The Researcher. Biology Specialist A did this by asking questions during and after the lecture. Information Specialist A indicated his interest by volunteering information; for example, he gave The Researcher a postcard of his work place at one of the lectures.

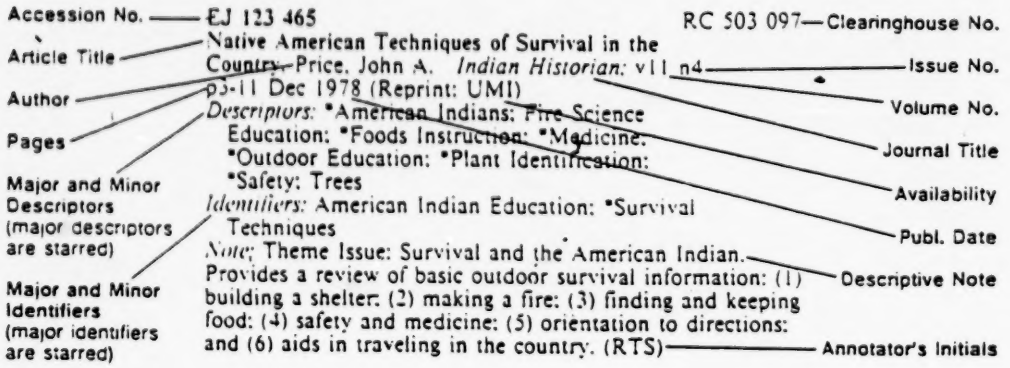
Procedures for faculty seminars were similar to the other seminars mentioned in Chapter Four. Through discussions on the usefulness and reliability of the questionnaires administered in the lecture series it was determined that participants had no experience with questionnaires of this type and that they had little experience in retrieving English language information in the manner presented in the questionnaires. The open-ended set of questions presented in Appendix B1 was considered a much better approach. Cooperation between various groups was discussed especially as it related to the CCERIC concept. Part of this discussion involved how a national network of database services could be developed into which the CCERIC network would be linked. Cooperation between the Educational Resource Center, the Educational Technology department and the Scientific Information Retrieval group was discussed. The Educational Technology department was seen as a link between the others two groups. Other discussions centred around the training of end users. Discussions were also held in relationship to search analyses. Recommendations (Appendix E4) resulting from the independent research project were also discussed with this group.

C.4 Lectures

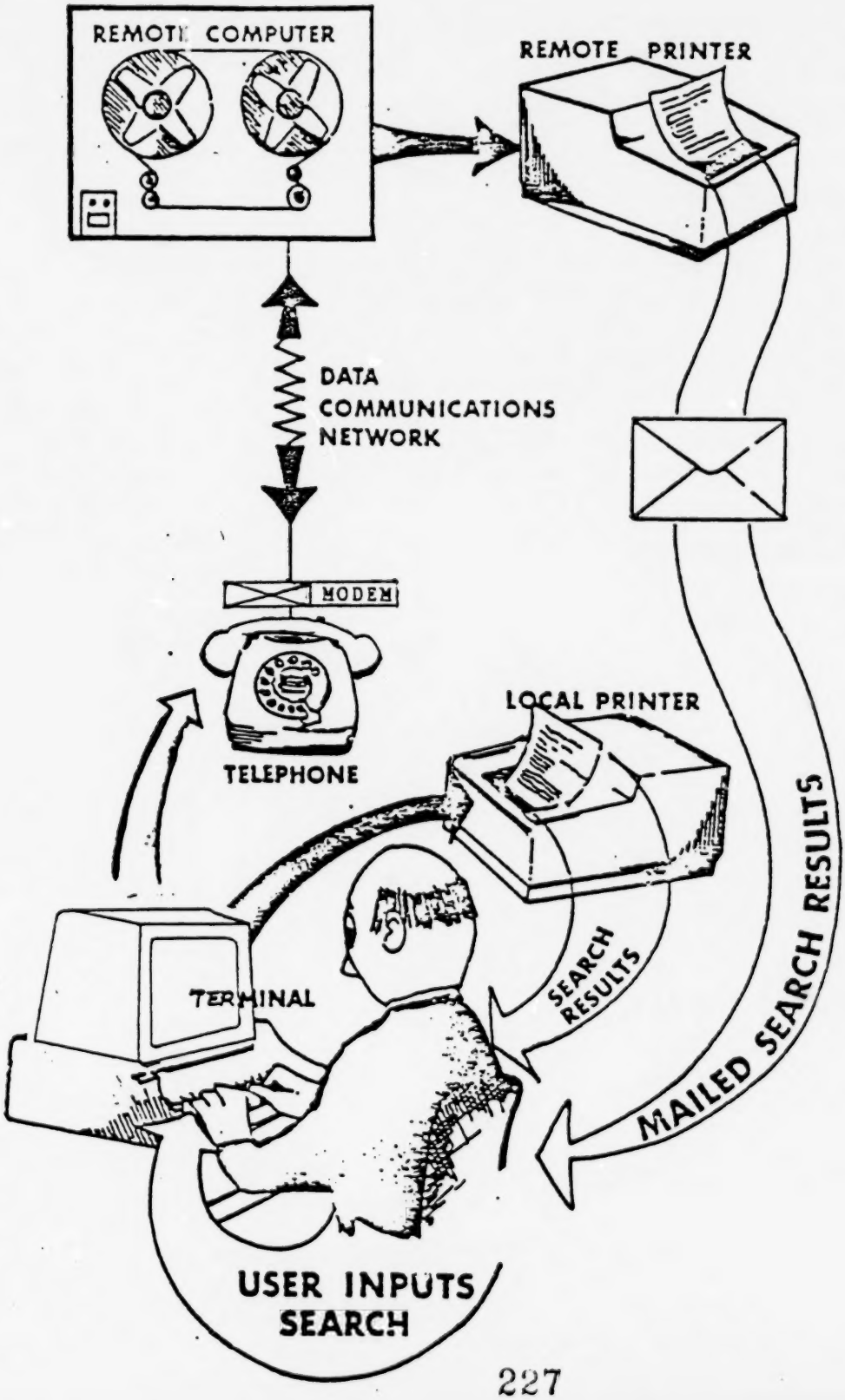
Lecture Overheads

Main Entry Section

Complete information about each article included in CIJE is given in the Main Entry Section, which is arranged by Clearinghouse and sequential EJ numbers.


Accession No.
EJ 123 465
RC 503 097
Clearinghouse No.
Article Title
Native American Techniques of Survival in the Country.
Author
Price, John A.
Indian Historian: v11 n4
Issue No.
Volume No.
Pages
p3-11 Dec 1978 (Reprint: UMI)
Journal Title
Descriptors: *American Indians; Fire Science Education; *Foods Instruction; *Medicine; *Outdoor Education; *Plant Identification; *Safety; Trees
Availability
Publ. Date
Major and Minor Descriptors (major descriptors are starred)
Identifiers: American Indian Education; *Survival Techniques
Note: Theme Issue: Survival and the American Indian.
Descriptive Note
Major and Minor Identifiers (major identifiers are starred)
Provides a review of basic outdoor survival information: (1) building a shelter; (2) making a fire; (3) finding and keeping food; (4) safety and medicine; (5) orientation to directions; and (6) aids in traveling in the country. (RTS)
Annotator's Initials

A TYPICAL ON-LINE SYSTEM



Software Evaluation Search

① software or ② computer program = ③

3 and ④ evaluation = ⑤ (1,000+)

3 and ⑥ evaluation criteria = ⑦

3 and ⑧ methodology = ⑨

9 not 7 = ⑩

5 and ⑪ Jn = Educational Technology = ⑫

Type 7

Type 10

Type 12

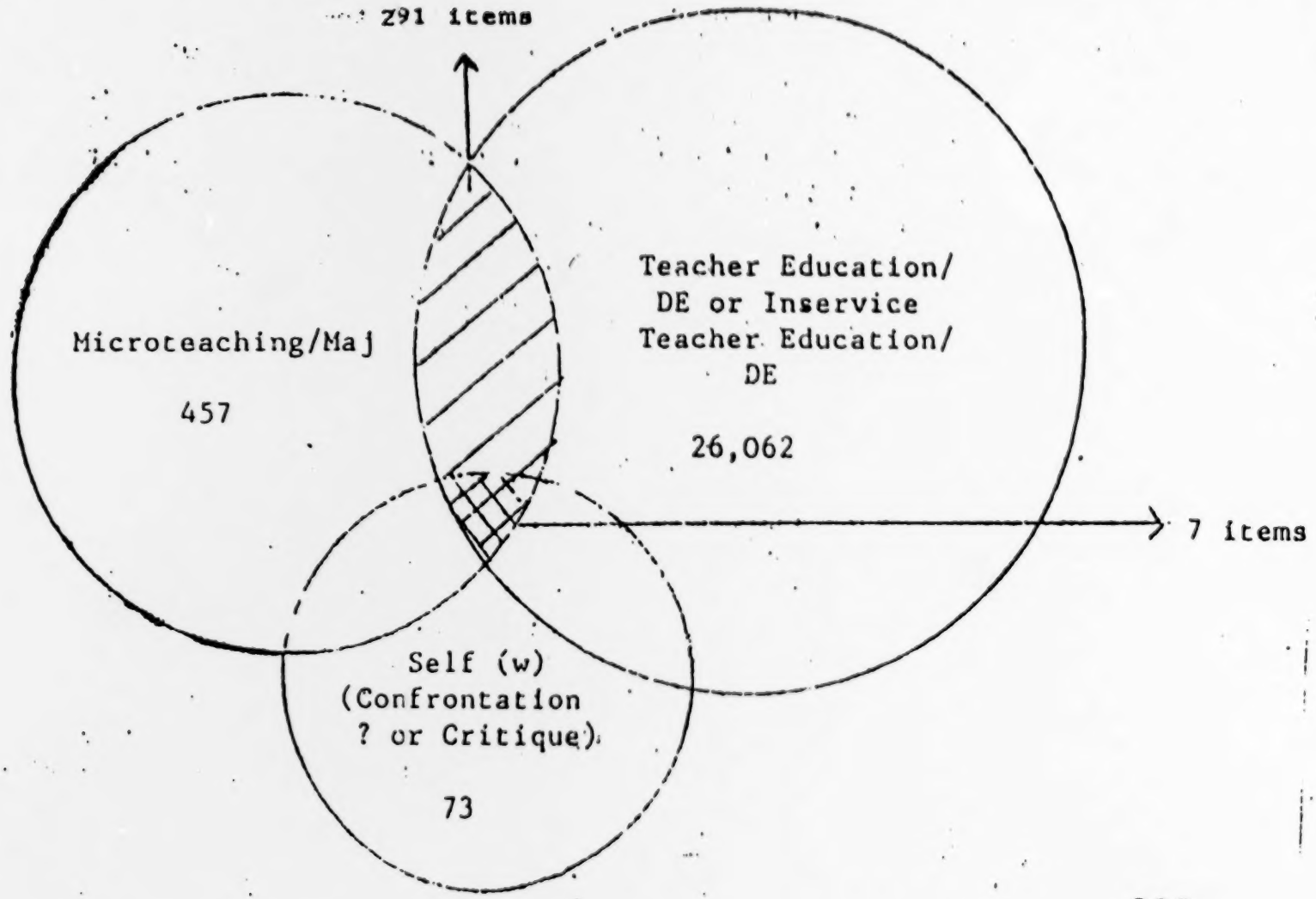
⑬ Apple Logo

⑭ Voyager (II)

14 and 3 = ⑮

Type ~~#~~ 13

Type 15


291 items
Microteaching/Maj
457
Teacher Education/
DE or Inservice
Teacher Education/
DE
26,062
7 items
Self (w)
(Confrontation
? or Critique)
73

220

229

230

Online verses CDROM

limit use	encourage use
limit time	take time
narrow search	broad search
offline print	save to floppy

Train info. specialists

Introduce Computer Searching

ERIC	CCERIC
Centralized	Networked
Print format	Computer format
Professionals	End users
Mainframe	Micro [WORM]

The basics of CD ROM

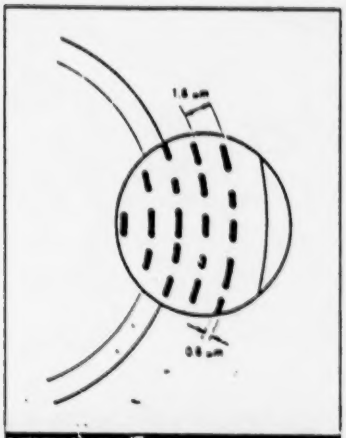


Fig. 1. Data are impressed into the substrate as a series of pits of variable length and are read by laser through the transparant substrate.

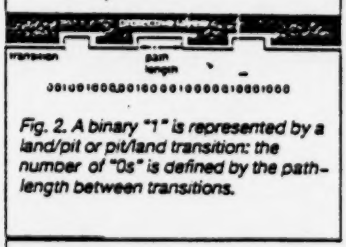


Fig. 2. A binary "1" is represented by a land/pit or pit/land transition: the number of "0s" is defined by the path-length between transitions.

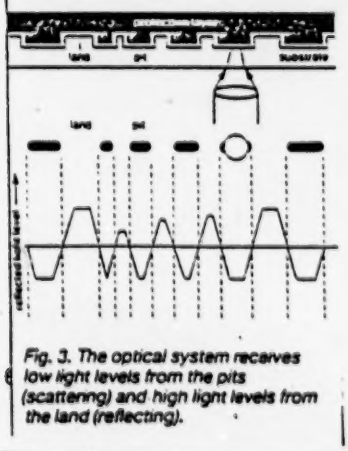
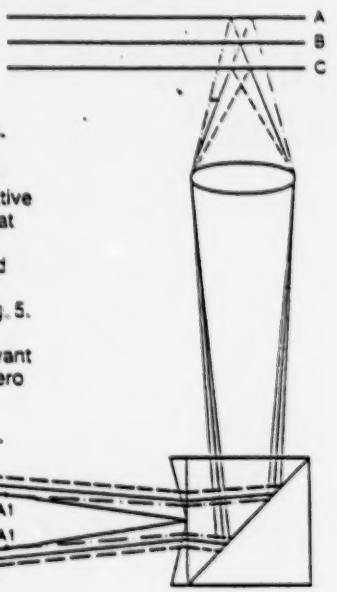


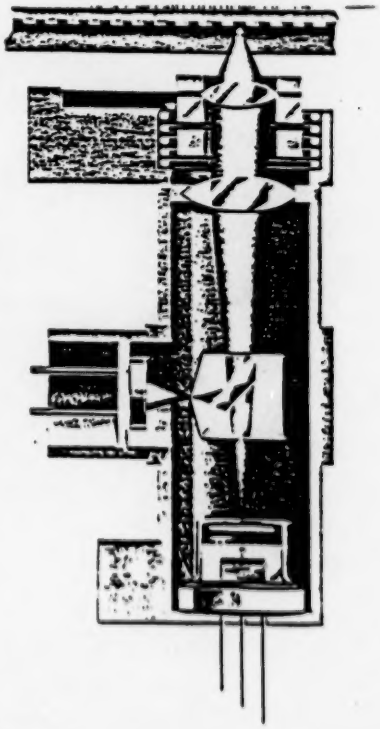
Fig. 3. The optical system receives low light levels from the pits (scattering) and high light levels from the land (reflecting).

Fig. 4. The principle of focus control.



$F_{error} = (D_1 + D_4) - (D_2 + D_3)$
and hence $F_{error} = 0$ when in focus.

This focus error signal is negative when the distance between objective lens and reflective layer is too great and positive when too small. It is amplified and fed to a coil situated around the objective lens in the optical pick-up unit (OPU). See fig. 5. The current in the coil causes the objective lens to move in the relevant direction until the error signal is zero and the beam is in focus.



The Lecture Series at Site A

Students were invited to participate in the lecture series through group and individual contact of research assistants. Faculty were invited through an invitation survey (Appendix B). Probably this was more successful than other surveys of its type, because it was in Chinese and English and it was developed and administered in close cooperation with Chinese research assistants. The general public was invited through a poster displayed in a prominent place on campus.

The first lecture in the series was a failure. First of all The Researcher was unable to obtain a reliable interpreter. Second, The Researcher only spent about 10 to 15 minutes lecturing with the balance of the hour being taken up with a pretest which should have taken only 10 to 15 minutes. Third, the audience, particularly the faculty, reacted to the pretest especially since they were unfamiliar with the content. Everyone was polite and answered the questions. The results indicated that 12 students were from the Educational Technology department, 9 students were from the Library and Information Science department, 6 were faculty and 3 represented other participants for a total of 30.

Due to the failure of the first lecture and pressures of midterm exams only 7 participants attended the second lecture, 16 the third lecture and 8 the fourth lecture. The content of the lectures was an expansion of the general lecture content described in Chapter Four. Although short questionnaires were administered at the end of each lecture, the results were considered unreliable, since most participants treated it as an academic exercise, without understanding the content. The most valuable feedback came from discussions with participants before and after the lectures.

The researcher gave other lectures at Site A and a conference. Although the topics of these lectures were not directly related to This Study they provided contacts which lead to the lecture at site F and exposure to Computer Based Education leaders at a conference hosted by The Researcher's host department. These lectures also helped establish The Researcher's credibility and willingness to help out.

Lecture to Biology Group at Site A

As mentioned above, Biology Specialist A had attended lectures and seminars put on by the Computer Based Education group. He arranged for the Researcher to give a lecture to the young teachers' group in his department. The lecture was also attended by some middle-aged teachers and a very old professor. Most of the young teachers had been her graduate students.

The lecture was given in English and most of it was translated and/or explained in Chinese. There was some interaction throughout the lecture. The lecture started with a discussion of accessing abstracts and then obtaining primary documents. The Researcher pointed out that access could be improved if computers were used to hook up various groups so that only one center orders an article from abroad. He also pointed out that research in this area is just starting.

Participants wanted to know where they could get textbooks and a demonstration of computer searching. This brought up the problem of

funding and cooperation between work units. The potential of accessing the Life Sciences Database was also mentioned. Several participants stayed to see a demonstration of the portable computer and take a picture. The old teacher summarized the importance of the lecture in English by referring to the portable computer and diskette as an important means of processing information. It was obvious that her students respected her and she supported them. She invited The Researcher to return and work with her students.

Lecture and First Visit to Site B

The host for The Researcher's first visit to site B (from the educational technology department) invited people to attend the lecture. At the request of The Researcher they not only invited people from their department but also people from the library department. Participants from the research institute included: some older faculty, and several young teachers and graduate students. The head of the computer group (Expert B) and some graduate students from the library department also participated in the lecture. The director of the Library was introduced to The Researcher but did not stay for the lecture.

This lecture consisted of filling in a questionnaire (Appendix B) and presentation of a formal lecture. While people were arriving for the lecture The Researcher introduced the questionnaire. Since there were approximately 10 questionnaires and 25 participants, two or more participants filled in one questionnaire, with a few having their own questionnaire to fill in. The Researcher used the questionnaire to introduce concepts related to accessing information. The Researcher and The Research Assistant assisted participants with problems. It was noted that older faculty were reluctant to fill in the questionnaire and young people welcomed the activity. In fact when The Researcher wanted to start the lecture his host suggested a few more minutes to allow participants to finish the questionnaire. Since this was the first time The Researcher had used questionnaires in the Chinese context, he did not understand that the novelty of the academic exercise, not the content of the questionnaire was the focus of attention. The content of the lecture consisted of the basic lecture content described in Chapter Four with more emphasis on optical disk technology.

Second Visit and Lecture at Site B

At the suggestion of The Researcher several people from the library group were invited to attend the first lecture at this site (see above). These included several graduate students and the head of the computer group (Expert B). Since Expert B had studied in America, he was quite interested in the research project. After the lecture tentative arrangements were made for his group to be The Researcher's host for his second visit to site B. These arrangements were finalized by letter and telephone. The computer group invited all but one participant to the lecture. This participant was invited by The Researcher after making arrangements with his host.

The lecture took place in a meeting room with participants and The Researcher sitting around a large table. Expert B acted as the interpreter. As part of the introductions The Researcher interacted with the participants, thus the concept of the "Introduce Yourself Survey" was born (see Chapter Four). This lecture was also the first lecture at which

the concept of CCERIC (Chinese Computerized Educational Resources Centers) was explained. The Researcher also explored with this group, organizations that had an interest in educational information related to specific ERIC clearing houses. The lecture content described in Chapter Four was also presented in this lecture.

In addition to giving the lecture, The Researcher visited the computer room of his host, which contained three MSDOS microcomputers, one of which was hooked up to a CDROM player. This system was used to access the library of congress information. Other contacts with this group involved making arrangements for The Researcher's visit. Many of these were made through a research assistant who had a limited understanding of English. Sometimes interpretation was used, while at other times communication was in limited English with The Researcher using some Chinese phrases. Once a relationship had been established communication was much easier, since the research assistant became more confident in using English. Future cooperation with this group was also discussed with the director and Expert B.

Lecture at Site F

The lecture discussed below is part of a series of lectures given to this group on topics related to the instructional uses of computers. The Researcher had presented one other lecture on software evaluation and the use of computer assisted instruction in Canada. Payment for the lectures followed a more traditional Chinese pattern. Since expert F was unable to obtain the full fee agreed upon by The Researcher's supervisor, he used his connections to have an old artist paint a picture for The Researcher.

The Coordinator for The Independent Research Project acted as interpreter and The Research Assistant typed the lecture and other information into the portable computer. Two participants in the lecture were faculty members in the host department and the other eight were representatives from industry. Most of the participants were middle aged.

The first part of the lecture was devoted to an Introduce Yourself Survey (see Chapter Four). In order to prepare for this survey participants had been given a list of questions at the previous lecture. One of the participants had typed answers in English to the questions, others either had not received the questions or did not understand English well enough to answer them or perhaps did not take time to consider them. At the lecture participants were asked to introduce themselves in English if they could or in Chinese if not. Most introduced themselves in Chinese. They were asked to give their name, what type of work they did, and their need for English language information, and where they would get the information if they needed it. The Researcher usually interacted with each participant, mostly through the interpreter.

The lecture was given in English and translated into Chinese. An English handout had been prepared for this group. A quote in the handout from the IDRC statements (Appendix A) was translated as an introduction to the lecture. Current Chinese practices were reviewed as they related to these statements. Reference was made to the Chinese Academy of Science system and the scientific and technical institute system. Then the need for some kind of system for educational science was mentioned especially for information related to the use of computers. The Researcher explained the ERIC system and computer searching using CDROM's in a similar manner to

the presentation of the lecture content described in Chapter four. At one point in the lecture there was a discussion amongst participants in Chinese which was summarized by the interpreter. The discussion centred around the similarity between The Researcher's proposal and the introduction in 1984 of a system to get information from the World Patten Index. At another point, one of the participants suggested a program developed by a Chinese professor as being useful. The lecture was concluded by giving an invitation to the participants to contact the interpreter if they wanted to see the CDROM system which was to be set up at site A.

C.5 Other Interviews and Visits to Groups at Site A

Several other direct or indirect contacts with the library group were made at site A. These included: visits by The Researcher and The Research Assistant (see research team above) to the periodicals reading room to obtain materials and to find out how ERIC was being used; using photocopy facilities; and attempting to get a library card. When The Researcher found out that it was a complicated process, he asked The Librarian (see Research Team in Chapter Four) to borrow a journal for him instead. Specific visits and interviews to the following locations are presented below:

1. The online search room
2. The microfiche room
3. The Educational Resources Center

Visit to the Online Search Facility at Site A

Within the first month after arriving at site A The Researcher had the opportunity of visiting the online search facility at that site. The facility had been in operation for less than four months, thus was in transition from being an experimental system to a service.

Through contact with one of the persons associated with the online service, who had attended the second meeting The Administration Group mentioned above; the Researcher's host department made arrangements for the visit. The three people who were involved in the service were involved in the visit. A research assistant from The Researcher's host department acted as an interpreter.

After the interpreter introduced the purpose of our visit, the primary searcher described and demonstrated the technology they used to gain online access to North American databases. Throughout the visit The Researcher interacted with the participants sometimes in English and sometimes through the interpreter. Technical issues such as the speed (baud rate) of the system were addressed. Other issues addressed related to: the cost of searching, potential uses of the service and alternate methods of gaining access to North American information. The training of information specialists in search techniques was also discussed, especially in relationship to the use of CDROM systems and participation in The Independent Research Project.

Visit to the Microfiche Facilities at Site A

Similar to the online facility mentioned above, this facility was also new and in transition from an experimental system to a service. Since many of the primary documents indexed in ERIC are available in microfiche format, microfiche is important to the use of ERIC.

In discussing the use of microfiche to access primary documents indexed in ERIC, with participants in the faculty seminars mentioned above, it was discovered that a microfiche facility existed at Site A. Information Specialist A volunteered to arrange for a visit to the facility. He accompanied The Researcher on the visit. Two staff members at the facility conducted the visit.

The visit consisted primarily of a demonstration of the equipment, which could not only read microfiche but also create, duplicate and produce paper copies of it. The only North American information available was microfiche from the Library of Congress. Arrangements were made for future experimental use of the microfiche equipment in conjunction with The Independent Research Project.

Visit to the Educational Resources Center at Site A

This center, as a regional center for educational materials, has one of the largest collections (both Chinese and foreign) in China. The center as such had been established in later part of 1978. The visit started with a tour of the facilities including rooms for Chinese materials such as a large number of exchange documents. In the foreign periodicals room The Researcher was able to look at their collection of the ERIC RIE (Resources In Education) abstract journals. Since the center had recently moved into new facilities, their computer equipment was not set up at the time of the visit. The visit concluded with an interview which is described below.

This group was one of the hardest groups to make contact with. Several approaches were made at different times through different channels, starting with a request for their participation when The Researcher first arrived. Eventually through the persistent efforts of The Coordinator (see research team in Chapter Four) a visit was arranged. Perhaps the moving into new facilities was a primary factor. Another factor was that no low level informal links existed between the research group and the center. The visit was conducted by the head of the center and an assistant. The Coordinator acted as an interpreter and participated in the interview.

Prior to the visit The Coordinator had obtained a draft of a Chinese document being prepared on the center. This document was verbally translated into English and typed into the computer by The Research Assistant. The typed copy served as a basis for the interview. Although some English was used by the interviewees most of the interview took place through interpretation. The Researcher also explained The Independent Research Project and asked if the center was interested in participating. The response was that until funding was obtained they were not too interested. The Researcher responded to this comment by illustrating how the host department and The Researcher had funded the project to date on a very limited budget. After the interview The Coordinator explained that

it was very rude to complain about one's finances and that he had explained The Researcher's intent in using the illustration.

C.6 Interviews at Sites C,D, and E and The Symposium

Interview at Site C

This interview took place at a technical information research institute connected with one of the national ministries. The setting was an office which had an experimental computer system set up in it. Participants are introduced below, followed by an overview of the content of the interview and concluded by a description of a demonstration of an integrated microcomputer system.

The selection of the site and expert C was done through contacts of The Researcher as described above. Expert C, who is one of the authors described above, was accompanied by assistants. One of the assistants served as an interpreter and made arrangements for the interview. Two others were there to listen and to demonstrate the computer system.

The interview started with brief introductions and The Researcher making arrangements to use a tape recorder. Note this is the only interview that a tape recorder was used. Although it was graciously accepted and did not seem to hinder the interview process, it seemed out of place at a first meeting. The approach of The Research Assistant typing data into the computer seemed to be more natural.

The major participant then began to answer the questions sent to him in The Researcher's letter, through the interpreter. The Researcher asked questions and a dialog began. Once the major participant felt comfortable he began to use English. He was very knowledgable about the technologies discussed and their application to China.

The interview concluded with a demonstration of an integrated computer system to be used to print Chinese documents. The system consisted of a laser printer, an IBM PC AT, and a WORM. The main feature of the system was that it allowed the user to change character fonts very easily. In using CCDOS (Chinese Character DOS) applications only one Chinese character font can be loaded into memory at a time because of the large amount of storage space needed for each font. The large storage space of the WORM is used to store fonts and thus making a very efficient system for using interchangeable fonts. As other technologies emerge and become stable they will be incorporated into the system.

As a result of this interview, arrangements were made for The Researcher to visit a major library (site G mentioned below) that had recently installed a Dialog OnDisc ERIC CDROM system. The possibility of presenting a paper at the second symposium was also discussed.

Interview at Site D

This interview took place in the conference room of a national institution for scientific and technical information. Participants are introduced below followed by an overview of the content of the interview.

The selection of site D and experts D1 and D2 was done through contacts of The Researcher as described above. Besides The Researcher and The Research Assistant two participants from the institute were present. Expert D1 was one of the authors mentioned above and expert D2 was one of the main organizers of the symposium.

The interview was conducted in English with no interpretation. The interview commenced with customary introductions and arrangements were made for The Research Assistant to type the content of the interview into a portable computer. Next, the upcoming second symposium was discussed. The Researcher then presented an overview of his research. Most of the topics discussed in the interview at site C were also discussed at this site. Since the participants were not as knowledgable about CDROM's and WORM's as expert C The Researcher needed to present more information at this interview. The concepts presented were well received. Participants mentioned their mainframe computer system which uses UNESCO software. They also mentioned a national microcomputer-based database project to disseminate information to rural areas and small towns.

The interview concluded by arrangements being made for The Researcher to present a paper at the upcoming symposium.

Interview at site E

This interview took place in a meeting room of a major Chinese online service. The Researcher, research assistant, and expert E sat around a large table in the center of the room, while others sat on chairs around the edge of the room.

The selection of site E and expert E was done through contacts of The Researcher as described above. Research assistants and graduate students, selected by expert E were observers for most of the interview.

The interview commenced by tea being served to those at the table. The interview was conducted in English of which the principal participant had an excellent command. Introductions included reference to the visit of The Researcher's Canadian professor, mentioned above. Next an overview of the services of the host institution was given. This included a discussion of compatible IBM PC and mainframe systems which used Chinese characters. Other topics discussed were similar to those discussed in the other interviews, with an emphasis on the dissemination of information using floppy disk. During the interview it was suggested that The Researcher present his views at the upcoming symposium.

The interview concluded with The Researcher being asked to recommend research topics for the graduate students and other questions related to his academic work. In closing The Researcher explored the possibility of an IBM PC database system developed by the host institution being used to process ERIC records.

The Symposium

As mentioned above The Researcher presented a paper (Ibsen, 1987c) at the "2nd Beijing International Symposium on Computerized Information Retrieval". This symposium was organized by the China Society for

Scientific and Technical Information and was supported by major Chinese scientific and technical information institutions. A brief description of the participants is presented, followed by an overview of paper presentations, the accompanying exhibition and other events.

The Researcher was selected to participate in the symposium through the interviews mentioned above. There were about 20 other foreign participants, some of whom presented papers, others were involved in the exhibition and at least one was there simply to attend the symposium. A wide range of countries was represented mostly from Western and Eastern European countries. About 50 Chinese attended the symposium, with representation from all age groups. These were invited to attend by the symposium organizers. Most of the Chinese participants had also participated the week prior to the symposium in a national conference on computerized information retrieval, to which more people were invited.

Presentations were given in Chinese or English, with simultaneous translation into the other language. Presentations were both theoretical and practical, with an emphasis on the systems either in operation or being developed by the institution represented by the presenter. Twenty of the presentations were given by Chinese participants, with an emphasis on systems for processing Chinese characters. Some of the Chinese presentations were given in English and some of them were given by young people. Thirteen of the presentations were given by foreign participants.

Eighteen Chinese and four foreign organizations had exhibits at the symposium. Many of the Chinese organizations had more than one product on display. Several of these were for processing Chinese characters, others could process both Chinese and English. Some were mainframe based and several were microcomputer based. Four English language CDROM databases were displayed. The foreign exhibits were basically online database vendors.

Besides the customary opening banquet and sightseeing tours, two other significant events took place in conjunction with the symposium. One was a visit to the newly opened National Library of China. The blend of modern technology and architecture with ancient Chinese artifacts and designs was most impressive. The latest in information science technology seemed to be implemented and operating efficiently. The second was a visit, in the Great Hall of the People, with the minister in charge of the State Science and Technology Commission of the People's Republic of China. He is also a member of the State Council which is "the highest organ of state administration" (China Reconstructs, 1988, p. 15) in China. He was well informed and seemed to be genuinely interested in the issues related to computerized information retrieval of scientific and technical information in China.

Appendix D
Additional Information on Research Findings

D.1 Sample Record from the Chinese Academy of Science Database

说　　明

1. 书录项目举例

J00018(1) 8400377(2) BJ45(3)
关于安全和有关问题的设想(4)
SOME THOUGHTS ON SECURITY AND RELATED ISSUES(5)
BARBER D.(6)
INFORMATION AGE(7)
BJ45(8)
E(9) C(10) 1983(11) V.5,N.3,P.157-162(12)
COMPUTER SECURITY, DATA BASE SECURITY, DATA PROTECTION(13)
SECURITY PROBLEM(14)

其中：(1)本刊编号，(2)文献库编号，(3)标引单位，(4)中文译名，(5)原文题目，(6)作者，(7)出处，(8)馆藏单位代号，(9)语种，(10)文献类型，(11)年代，(12)卷期页，(13)主题词，(14)自由词。

2. 语种代号

英文(E)，日文(J)，中文(C)，法文(F)，德文(D)，俄文(R)。

3. 文献类型代号

期刊(J)，会议录(C)。

4. 馆藏单位代号

SY02 中国科学院沈阳计算技术所
CD06 中国科学院成都计算机应用所
BJ44 中国科学院北京自动化所
BJ41 中国科学院北京电子所
BJ42 中国科学院北京电工所
BJ45 中国科学院北京计算中心
SY03 中国科学院沈阳自动化所
BJ40 中国科学院北京计算所

D.2 The Need for English Language Information by The Science and Technology Group

Several learn English as well as German. In a survey conducted by Huang and Zhao (1987) only 7.86% indicated that a major reason "for not using computerized information retrieval [was] not understanding foreign languages". Since many of those who study science and technology learn German as a foreign language this figure would primarily refer to both English and German languages. Another major reason given by 14.53% of those surveyed was that the coverage of [databases was] insufficient. This may indicate that foreign language information is not available or that it is available from other sources or that it is not available in

German language databases. The result of the introduce yourself survey conducted during the lecture Site F indicated that 7 out of 8 participants, from industry, seldom or never used English language information. The other participant from industry used English language information regularly.

D.3 Computerized Information Retrieval

A survey of selected users (factories and enterprises 47.7 %, research institutes 16.9% and universities and colleges 31%) in the Chinese engineering industry indicated that 22.5 % had used computers to retrieve information and 67.7 knew about it but had not used it (Huang and Zhao, 1987). More than 90% had a favourable impression of computerized information retrieval. Zhou (1987) indicates that almost 90% of the institutions using the ISTIC (Institute of Scientific and Technical Information of China) online service were either directly or indirectly involved in research or academic organizations and only 8.1% were from industry. This finding corresponds to a need for English language information by industry.

Huang and Zhao (1987) indicate that, although there are many service personal trained in computerized information retrieval, several enterprises do not have trained staff. In their survey the most frequently mentioned reason "for not using computerized information retrieval [was] lack of computerized information retrieval knowledge" (33.3%). They point out that both the end user and information specialist need training and need to cooperate together in order to overcome this problem. Several people associated with the symposium mentioned a need to promote the popularization of computerized information retrieval. If this is to happen more training is needed.

The Researcher was only able to find one institution which provided specific training for information specialist in searching North American databases. This institution uses a computer simulation to give students practice. From observing one of their graduates (information specialist G) searching on a CDROM system this training seems to be reasonably effective. One of the reason he was effective may also be attributed to being able to practice with the CDROM system.

D.4 Experiences With Computer Searching

In this appendixes three experiences with computer searching are reported. The first is that of the online search group at Site A. The second is that of Information Specialist A and the third is that of Biology Specialist A (both of these were participants in the faculty seminars at Site A).

Although the online search group at Site A seemed to have a good technical knowledge of how to use their system, reports from others indicated a lack understanding of other aspects of the search process. The main concern seemed to be to spend as little time online as possible to save search costs. Accuracy of the results was secondary. For example, they reported an average search cost of $10.00 US per search and did not check results before off-line printing. One technical problem encountered in online searching was the inadequacy of the telephone lines to use 1200 baud communication, thus 300 baud had to be used.

Information Specialist A's job was to find information for faculty and staff and teach information retrieval courses at a university. He has had two successful computer searches done for his clients, one of the World Patent Index (WPI) and the other of the INSPEC database. For both searches a manual search was conducted first to find the most appropriate terms for computer searching. For the WPI search the IC (International patent Class) code was used, 38 items were printed, 10 of which were useful and one which was exactly what the client wanted. Updates to the search are done manually on a monthly basis using the IC code. For the INSPEC search, terms were combined to produce a narrow search with seven items being printed. Although the library at the information specialist's university has recently opened an online search service, he would not use this service because it runs at a slower baud rate and the staff are not as familiar with the subject matter and the search process, as those at the major information institution at which the first two searches were conducted. Most of the information specialist's clients are afraid to do computer searches because of the cost and the chance of getting the wrong information or results which are not as good as manual searching.

Information Specialist A uses the above mentioned searches as illustrations in his information retrieval courses. Three out of the four information specialists in his work group also teach computerized, as well as manual, information retrieval as part of their courses. Information retrieval courses are taught to undergraduate students in many of the departments in his university.

In contrast to Information Specialist A, the experiences of Biology Specialist A were unsuccessful and very expensive. Biology Specialist A needed some specific information for a research proposal and thought computer searching would save time. He had no previous understanding or training in computer searching. He was given little guidance in formulating his search request. Although he was present during the search he did not have enough understanding to help guide the search. The first set of key words produced a set of 1000 records; which was narrowed to 10 records, which were printed, none of these were related to his request. Two of the three terms were combined to produce a set of 100; these were printed off-line; none of them were relevant to the search request either. The set was not examined online to see if it was relevant prior to printing. It was determined that limiting the search to the title field was the best approach. Since a large amount of money (200 yuan) had already been spent this possibility was not explored further. The end user attributed failure to: the information specialist's lack of understanding of Biology and inexperience in searching. Another factor limiting the search was that the equipment being used only operated at 300 baud so this may explain the use of off-line printing without examining the results online. It is also possible that there were no articles indexed in the database related to the search request. Since then Biology Specialist A has attended some of the sessions given by The Researcher and gained a new understanding of the search process. He would like to learn more about the search commands and gain some practice, using a CDROM system, before doing another online search. In the future he would do a manual search first to get some ideas in order to guide the computer search. The reason he did not do a manual search in this case is that his reading room did not have the printed indexes to do a manual search.

D.5 Results of Biology Group Introduce Yourself Survey at Site A

Most of those (13 out of 14) who responded to the introduce yourself survey indicated that their reading room was the primary source of information. One person indicated that the main library was his major source of information. Others indicated that this was a secondary source. Many of those surveyed obtained information through the Academy of Science system. They indicated that it took about two months to get the information.

Some indicated that they write to the author to get primary documents and one person asked professors who would go abroad to get him information. One person indicated that sometimes information is sought from another major city in China but this is not often done because communication is slow and they probably don't have much more information than is available locally.

D.6 Foreigners Experience With FEC and Renminbi

Many of the problems with FEC and Renminbi stem from the fact that FEC is legally equal to Renminbi but one and a half times its value on the black market. Foreigners are constantly being asked to change money, which is illegal. The FEC system also creates other inconsistencies. For example, depending on a person's status and joint agreements, he or she may pay different prices for the same food in the same cafeteria: foreign researchers may pay a fixed rate per day or per meal no matter how much is eaten, some foreign students would pay less, since they are allowed to buy tickets with FEC and only pay for what they eat, and other foreign students would be allowed to buy the same tickets with Renminbi. Many of the negotiation and other problems encountered in The Independent Research Project revolved around access to FEC. The Researcher was seen by some of the university officials as a source of FEC. This was never sensed to be a personal matter but a matter of general government policy. In fact, on a personal basis most colleagues tried to help The Researcher save his FEC.

Appendix E
Additional Information on CCERIC
(Chinese Computerized Educational Resources Information Centers)

E.1 CCERIC Report and Computer Club Analysis

1. Checking the Head of Educational Curriculum Committee for Information Retrevial course of undergraduate students of our Institute again.

2. Contacting Adult Education Institute.

3. STUDENT SEARCH ANALYSIS:

2).They are allowed to look up new words in dictionary. Mr. also answered their questions concerning both Computers in Education and ERIC.

3).These students have compartively strong background in programming. They are going some projects as programmers under Mr. Zhang Ming's direction.

4).It took approximately 45 minutes to finish the analysis.

5).They showed their interests of Computer Languages and their development very much.

6).All of them realize the necessity of Information Retrival. They would like to take the course in this field if possible.

4.SUGGESTIONS AND COMMENTS:

1).According to the interests of students, I would do the real search on CDROM for both Computer Club & English Club of our Institute if the CDROM arrive at ECNU before mid-June.

2).Checking for the Information Retrevial course again. Ask the students to take this course as a selected c o urse in other dept. or as summer course under the condition that there is no response to my requests.

3).Trying to persude concerned staffs to do the analysis in summer vocation.

4).Hoping to get direction(comments at least) from Mr. David Ibsen for the reports(including REPORT (I)) and the progress.

5).Trying to make the analysts familiar with the microfiche machine. Let them study the papers on microfilch I received a few days ago from USA. They will disseminate this idea to most of the students.

5.Showing the microfiche to two club members and comparing it with photocopy. So students made a clear idea in this situation.

CCERIC STUDENT SEARCH ANALYSIS SHEET
(SAMPLE)

For each record of importance put codes for the following on the search analysis sheet.

Importance Codes:
0 No importance
1 Critation importanct
2 Full text importanct
3 Full text very important
4 Full text urgently needed
5 Other

Read Codes:
0 Did not read
1 Read parts of it
2 Read all of it
3 Studied it in Detail
4 other

Personal Interest Codes:
0 Not interest
1 Some Interest
2 Interested
3 Very Interested

Usefulness Codes:
0 No use
1 Some use
2 Useful
3 Very useful
4 Useful for others
5 Other

Search #:_____Title:_____Paper Copy____Microfiche_____

Analyst:_____
(family name) (first name) (middle name)

Position:_____

Record #	Importance	Interest	Read	Usefulness	Comments
ED225562					
ED278211					
ED277401					
ED277361					
ED277359					
ED275332					
ED274326					
ED272189					
ED272186					
ED272184					

E.2 A Description of The Preadoption CCERIC Plan

As a result of the Independent Research Project introduced in Chapter Four, a Preadoption Plan for CCERIC was developed. The Researcher's Model introduced in Chapter Three was used to analyze this plan (see Chapter Six). As a result of this analysis a Pilot Study Plan for CCERIC was developed. Since the following sections of the Preadoption Plan were included with minor modifications in the Pilot Study Plan, they are not repeated in this Appendix: Access to Resources, Cooperation and Networking, Benefits and Losses, Policies, and Strategies. The following sections of The Preadoption Plan are presented below: Needs Analysis, Leadership Support, and Operational Plans.

Needs Analysis

Although a formal needs analysis was not the focus of The Independent Research Project, needs were assessed in relationship to the need for: computer information retrieval systems, CDROM systems, and ERIC.

The need for *computerized information retrieval systems*, is evident from the results of The Independent Research Project. Most groups involved in the project are developing systems which can process information using both Roman and Chinese Characters. Various groups at both sites A and B are developing and or implementing systems which use both character sets to process bibliographic information. Although This Study focuses on the processing of English language information indexed in the ERIC database, the eventual CCERIC network would place priority on processing Chinese information, since this is the greatest need.

The need for CDROM information retrieval systems is evidenced by the initial use of various systems in China. Site B has installed a CDROM system, to access Library of Congress records. Site A is in the process of installing a Dialog OnDisc ERIC CDROM system, for educational use. Since potential users of computerized information retrieval systems do not have experience in using them, educational systems of this type are needed to demonstrate the usefulness of computer searching. Since no additional costs, such as online charges, are involved; CDROM systems are an ideal way of experimenting with computer searching both for information specialists and end users. CDROM systems are more economical than online systems for information retrieval, if there is sufficient volume to cover the subscription price in comparison with online costs. Another advantage of CDROM systems is that funding arrangements involving FEC only have to be made once and renewed yearly not paid on a monthly and per search basis.

The need for ERIC is evidenced by the investment in several means of accessing ERIC and by the results of the analysis of ERIC records at site A. The only known means of accessing the whole ERIC database in China is through online searching or use of a CDROM system. Although most of the primary documents indexed in RIE (Resources in Education, part of ERIC) are available on ERIC microfiche, there is no known center which has a collection of ERIC microfiche. Furthermore, access to primary documents indexed in CIJE (Current Index to Journals in Education, also part of ERIC) is extremely difficult apart from journals located at ones own institution. Since individual institutions which need ERIC, do not have enough resources or need for ERIC to develop their own comprehensive ERIC system; a method is needed so that resources can be shared.

Although computerized access to ERIC is available in China, many educator's who need access to ERIC abstracts do not have access to them. Since access to primary documents is very limited, a network is needed so that documents that are available in China could be more accessible.

Leadership Support

As Chapter Five, both the researcher and those interested in cooperating in the research at sites A and B have departmental support. Institutional support would be obtained if funding were available. Leadership support at site G is unknown. National level support for the use of ERIC needs to be obtained if CCERIC is to be implemented on a national level. Support from Canadian or American agencies would encourage national support.

Operational Plans

Since strategies have not been agreed upon, most operational plans are premature at this point in the research. Many of the strategies mentioned in Chapter Six could be implemented if personnel and cooperative agreements between various Chinese groups were in place. Both of these require leadership support at an institutional and national level. The only connection, with respect to ERIC, between the various groups is the contacts made by The Researcher. Since one of the ways of obtaining leadership support and bringing various groups together is to obtain funding from North America, this is the primary operational plan at this time.

E.3 Operational Plans for the CCERIC Pilot Study

In discussing details of the operational plan for the CCERIC Pilot Study, the person who is referred to as The Researcher elsewhere in This Study will be referred to as The Principal Investigator. The following plans have not been implemented due to events in China and budget cuts in Canada. The Researcher is attempting to make arrangements to visit China in the summer of 1990 to discuss his research.

Stage I Activities in China (July 25, 1989 - August 31, 1990)

Stage one of the Pilot Study is the initiation stage and will primarily involve negotiations on the Chinese side and obtaining funding on the North American side. As indicated below some research and other activities will also take place.

Initial Negotiation Visit (July 25 - August 7, 1989)

The major purpose of this visit is for The Principal Investigator to discuss the initial Pilot Study plan presented in This Study with potential Chinese participants at sites A, B, and G (see Chapter Four for an introduction to these sites). A secondary purpose of the visit is to initiate the ongoing research activities listed below.

Initial Plans for Chinese Cooperation

As mentioned above some of the strategies for implementing CCERIC do not require additional funding but rather operational plans for cooperation. These plans are briefly outlined as follows:

1. Implementation of an initial ERIC search network with sites A, B, and G as the principal participants.
2. Development of an initial network for obtaining primary documents indexed in ERIC.
3. Inviting others to participate in CCERIC.
4. Research into potential methods for clarifying CCERIC records.
5. Initial research into potential computer systems for CCERIC.

Evaluation and Final Negotiation Visit

The major purpose of this visit is to finalize negotiations for the Pilot Study and the related joint research project. A secondary purpose is to evaluate what has taken place with respect to the above mentioned operational plans.

Stage I Research and Development in Canada (June 1, 1989 - June 30, 1990)

The primary Canadian activity of this stage is to obtain funding and based on this funding to conduct initial research activities.

Obtaining Funding

Funding is needed to cover basic research expenses, for travel, and for stage II of the Pilot Study. It is anticipated that funding for different purposes may be obtained from different sources. Funding needs are outlined below and a formal budget would be developed in conjunction with negotiations:

1. Basic research funding includes: The Principal Investigator's salary, salary for part time staff (a research assistant and secretary), and administrative expenses such as office supplies and telephone.

2. The travel budget would include attending North American conferences, visiting specific sites (mainly related to ERIC), and trips to China by the Principal Investigator and Chinese research assistants involved in the Canadian side of the project.

3. Stage II funding would be an extension of stage I funding with additional funding for the joint research agreement and for obtaining primary documents.

Initial Research Activities

Depending on the availability of funding the following initial research activities could be conducted (activities are listed in order of priority).

1. Fully develop the Pilot Study plan presented in This Study.

2. Develop and negotiate a joint Canada/China research agreement.

3. Evaluate relevant information systems and select one for use in developing a prototype system.

4. Develop and pilot test a prototype system for analyzing ERIC records, and disseminating the results.

5. Based on the Pilot Study plan and further research, develop a checklist for a comprehensive CCERIC plan outlining the contribution of each research site to the plan.

6. Gather materials for and begin development of educational programs on computerized information systems and CCERIC.

Stage II Research and Development in Canada (July 1, 1990 - June 30, 1991)

Stage II will involve the implementation of the joint research agreement, the continuation of research commenced in stage I and the development of a comprehensive plan for CCERIC.

Orientation of Research Team (July 1 - August 31)

This will be the first activity of the joint research agreement. Participants in this activity will be The Principal Investigator, Canadians who will be conducting research in China and Chinese who will be conducting research in Canada. The orientation will consist of a comprehensive evaluation of the current CCERIC plan and an introduction to both the Chinese and Canadian contexts.

Ongoing Research (September 1 - June 30)

One of the major research activities of stage II will be a comprehensive evaluation of technologies and methodologies which could be potentially used in developing the CCERIC network. It is expected that this and other research at the Canadian site will make a major contribution to the development of the comprehensive CCERIC plan.

Stage II Activities in China (September 1, 1990 - June 30, 1991)

During stage II activities at Chinese sites will concentrate primarily on implementation rather than research and development.

Orientation of Research Team (September 1 - October 31)

The purpose of this orientation is to orient Canadian members of the China team to the Chinese context and to orient Chinese members to the Pilot Study. The Principal Investigator will also be involved in this orientation.

Ongoing Activities (November 1 - June 30)

In addition to continuing the activities initiated in stage I, the prototype system developed in Canada and national subject networks will be implemented. The subject networks, which will be for Computer Based

Education and Library Automation subject areas, will not only provide access to information available in China but also from abroad.

Evaluation and Finalization of the Comprehensive CCERIC Plan

The Principal Investigator and at least one of the Chinese members of the Canadian research team will conduct the evaluation and negations needed to finalize the comprehensive CCERIC plan. Part of this plan will be the continuation of the joint research agreement.

E.4 Recommendations for CCERIC from The Independent Research Project

It is recommended:

That the concept of CCERIC (Chinese Computerized Educational Resources Information Centers) continue to be developed:

1. By setting up a national center for the processing of information related to the ERIC database. This center should be attached to an existing work unit. It should also receive funding for a subscription to microfiche copies of ERIC documents and to purchase other ERIC documents as needed. This funding should be obtained from Chinese sources.

2. By developing a network of clearinghouses, dissemination centers, and search centers. This network would be developed by having each reading room or work unit library which subscribes to journals in ERIC submit a list of their journals to the national center. Major dissemination centers, such as the education technology library at Site A, would be designated to act as clearinghouses.

3. By providing funding to purchase original documents not available in China from abroad. This would be done by end users sending an analysis of their searches to Canada in order to obtain original documents. Funding for this purpose will be sought from North American agencies.

4. By registering ERIC service centers in China, so that they can be included in the Directory of ERIC Information Service Providers.

That research into educational information processing systems in China continue:

1. By publishing two papers, one in Chinese and one in English presenting the results of the research.

2. By setting up a research center in Canada. This center would study educational information processing and the use of ERIC in North America. This study would be conducted to determine future direction of the research and to develop computer systems for CCERIC.

3. By holding conferences and workshops in China (summer of 1989). The main conference being a National Conference to develop

plans for further research.

4. By developing an exchange program, whereby one or more Canadians would work on the research in China in exchange for one or more Chinese working on the research in Canada.

That implementation of Dialog OnDisc ERIC System at the host University be done in such a way as to insure maximum use through work unit cooperation:

1. By installing the system on a microcomputer which is used for the primary purpose of doing computer searches.

2. By installing the system in a work unit which has personnel who are able and available to assist others in using it.

3. By providing free access to the system to other work units as scheduling permits. For example, the Library and the Scientific Information Retrieval Group could use the system for training of end users. The Library and Information Science Department could use this system for training information specialists. Work units like the Educational Resource Center and the Institute of Modern Educational Technology could use it for end user searching.

4. By integrating the CDROM system with the existing magnetic tape system to provide comprehensive access to the ERIC database. For example, the magnetic tape system maybe used for SDI (Selective Dissemination of Information) searching and the CDROM for retrospective searching.

5. By the university at Site A purchasing a Thesaurus of ERIC descriptors to aid end users in preparing for a search.

That the host department in conjunction with the Scientific Information Retrieval Group develop a course in information retrieval. This course should include computer searching and the use of microfiche.

That the Biology Department at the host university attempt to make arrangements to analyze searches from the Life Sciences database.

That a National Directory for Information Services in China be published. This directory should include search centers, clearinghouses, and descriptions and evaluations of information processing software.

E.5 An Invitation To Participate In CCERIC

CCERIC (Chinese Computerized Educational Resources Information Centers) is a network of information centers which use computer technology to access educational information. The concept of CCERIC is being developed by the Host department for The Independent Research Project in cooperation with The Researcher. Currently, the CCERIC project is exploring ways to use computer searching of the ERIC (Educational Resources Information Center, located in the United States) database on CDROM (Compact Disk Read Only Media) to obtain access to English language educational information.

Since a computer search of ERIC only produces abstracts, it is necessary to find a way to obtain the original documents. To find out which original documents are available in China, we are asking information centers which subscribe to journals which are abstracted in the ERIC database to join CCERIC. Information centers that join CCERIC will benefit by learning how they can use modern technology to gain better access to English language information. They will also benefit by receiving a list of journals which are available from other members of CCERIC.

To participate in CCERIC, one needs to complete an application (see enclosed example). The application should give the name of the person to contact regarding CCERIC; and the name, address, and telephone number of the information center making the application in Chinese and English. It should contain a complete list of all journals abstracted in the ERIC database which are found in the information center. It should contain a list of other English language journals related to education. If possible a list of all journals in all languages found in the information center should be included. The application could also list the names and search interests of people related to the center who have done or plan to do searching of the ERIC database.

To obtain more information on CCERIC, Computer Searching and/or to obtain a list of journals abstracted in the ERIC database, please contact: